NETWORK WORLD

THE WEEKLY FOR LEADING USERS OF COMMUNICATIONS PRODUCTS & SERVICES VOLUME 3, NUMBER 37 NOVEMBER 17, 1986

▶ INTERNETWORKING

Tandem ties into NETBIOS networks

Move may incite server fight with Novell.

BY MARY PETROSKY
West Coast Correspondent

CUPERTINO, Calif. — Tandem Computers, Inc. is expected to announce today it will tie its fault-tolerant systems to a wide range of local-area networks by supporting IBM's Network Basic I/O System (NETBIOS), a strategy that contrasts with the approach taken by most minicomputer vendors that support only specific networks.

In addition to offering users flexibility in the selection of local networks, Tandem's NETBIOS support will allow the company to market its on-line systems as fault-tolerant file servers, a move that could put Tandem squarely in competition with local net vendors such as Novell, Inc.

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FEATURE FOCUS

Communications processors weave the right connections

Attaining functionality without overkill.

BY JOHN J. HUNTER
Contributing Writer

What is a communications processor, anyway? Is it strictly a front-end controller like the IBM 3705 or 3725, or is it as simple as a packet assembler/disassembler (PAD) linking a terminal device to a public or private packet net? Or is it like a protocol converter that emulates an IBM 3274 controller?

Network designers say that a communications processor should be a multifunctional, intelligent device capable of establishing a connection to send and receive data, multiplexing/demultiplexing data, framing and unframing messages,

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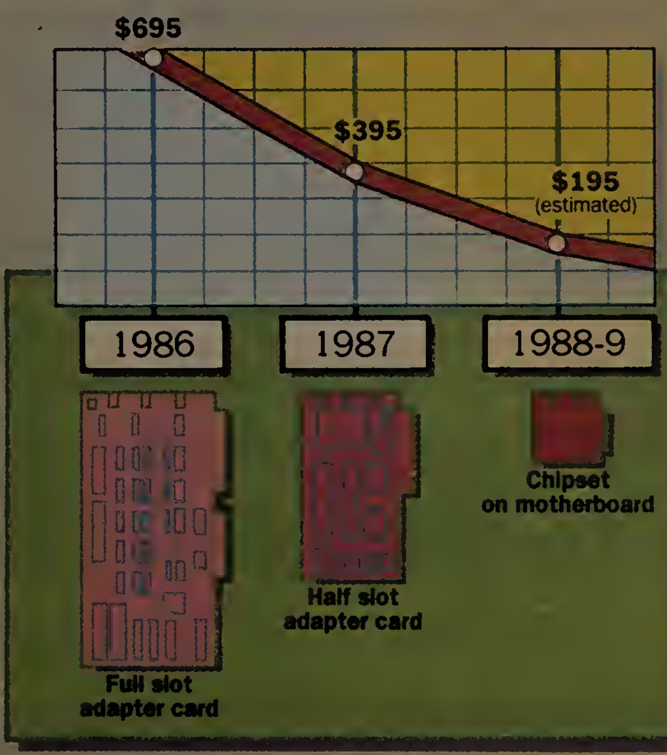
LAN connection costs dropping



Smaller chipsets enable vendors to slash costs

▶ LOCAL NET TECHNOLOGY

Floor dropping fast on LAN link costs

BY PAUL KORZENIOWSKI
Senior Editor

A movement to reduce the size of the chipsets that link personal computers to local-area networks is expected to produce as much as a 50% decrease in local net connection costs in the next few months. Beyond that time frame, costs could drop so far that local net connections may be-

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NETWORK LINE

News

Issues topping the agenda at this week's Localnet '86 conference in San Francisco include data security, local-area net connectivity and the use of fiber-optic transmission medium. Page 2.

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If the Department of Justice's "Huber Report" follows expectations, the Modified Final Judgment may be relaxed, putting Bell operating companies in the driver's seat with the freedom to manufacture telecommunications equipment.
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The saga continues for Data General and Dama, as the latter is forced to file for protection under Chapter 11, with some prodding from its minority shareholder, DG.
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Let the vendors beware! State telecommunications chiefs are ready and willing to start dictating policy to vendors, which until now have had the total say. Page 4.

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National networks reach the main line with Train II, a net used by the U.S.' largest freight carriers to monitor and speed information concerning their combined rail systems.
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The complexion of the Autofact conference was altered last week with the addition of newcomer Ameritech and a trio of fiber-optic LAN vendors, in a show long dominated by machine tool vendors
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Features

To manage data transmission facilities successfully, users should strive to take a broadview when considering their information and communications needs.
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NEWSPAPER

▶ LONG-HAUL LANDMARKS

SDN and Megacom are coming of age

At first birthday, AT&T services celebrate a successful year.

BY JOHN DIX
Senior Editor

AT&T's Software Defined Network (SDN) and Megacom services enjoyed happy first birthdays this month due to greater than anticipated user acceptance of the industry-shaping offerings.

SDN and Megacom were proposed in early 1985 and tariffed in November of that year. SDN is an alternative to voice-grade, private-line networks, and Megacom and Megacom 800 are bulk calling options for the largest WATS and 800 service customers. Since SDN and Megacom bowed, all of AT&T's major competitors have introduced similar services.

Contrary to some reports, AT&T claims SDN has met with great success. "SDN is well above our initial projec

See **AT&T** page 54

▶ LOCALNET '86 PREVIEW

Localnet show to throw spotlight on user issues

Focus placed on security, connectivity.

BY JIM BROWN
New Products Editor

SAN FRANCISCO — As the Localnet '86 conference opens here this week, local network users are wrestling with the problems of tying local networks together, providing access to mainframe data and protecting that data from unauthorized use.

Managers interviewed by *Network World* prior to the show unanimously voiced concern over local net connectivity and data security issues. Consolidation of local net cabling and the availability of multiuser software geared for nontechnical users were also cited as prime concerns for users who only recently laid to rest their initial local net selection and installation problems.

Those topics are slated to be addressed during the show's user-oriented technical sessions. Other sessions will focus on issues including the management, control and implementation of local networks and the use of fiber-optic transmission media. A second platform of sessions is geared to covering the technology and development issues vendors are currently tackling.

"I'm sure the program won't address everything. But, I think it will address the key elements that people are talking about now," said Peter Shaw, conference director with the show's sponsor, On-line International, Inc.

Localnet '86 is being held in conjunction with On-Line International's Open Systems and International ISDN conferences. Those conferences will focus on the development of computer systems using the International Standards Organization's Open Systems Interconnect model and the emerging implementation of Integrated Services Digital Network telephone offerings.

After meeting with some success in the UK, the conferences are be-

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▶ CHAPTER 11

DG to gain from Dama bankruptcy?

Data General seen as force behind carrier's cost-paring efforts.

BY PAUL KORZENIOWSKI
Senior Editor

PARSIPPANY, N.J. — In a plot that is beginning to resemble a soap opera, Data General Corp. has apparently blessed the Chapter 11 filing of Dama Telecommunications Corp., a company DG is relying on to add transmission offerings to its product line and one that eventually may become DG property.

Dama, a privately held company located here, last week filed for protection under federal bankruptcy law in a federal district court in Maryland. DG, a minority shareholder in Dama, pushed for the filing because Dama owes DG $20 million in outstanding loans. The filing, which will lead to a reorganization of the company, is the latest in a series of steps DG apparently has prompted since it purchased the minority interest in January.

At that time, Dama was hired to build a private net that would replace DG's current network, which is based on a private packet-switching system supplied by GTE Telenet Communications Corp. DG planned that by the end of 1987, when the new network was to have been completed, it would be selling network capacity to its computer customers. DG also gained a seat on Dama's board of directors and acquired an option to purchase all Dama-held stock. In January, it appeared likely that DG would fully acquire Dama. But after taking a close look at the company, DG may have decided cost-cutting steps were in order before a purchase would be made.

In the last few months, a number of such steps have been taken. Dama's staff was cut from 80 to 55 employees. In August, Thomas E. McInerney, former president of Dama, was asked to leave the company. The Chapter 11 filing seems to be the latest step. When asked what role DG played in the decision to file for reorganization, a Dama spokesman told *Network World*, "DG supported the filing, but the decision was reached by Dama's board of directors."

Dama, which was founded in 1982, has two lines of business. The company resells capacity on a private voice net purchased from International Harvester Co. a few years ago. Also, Dama sells wide-area digital network services based

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Powerhouse Novell fortifies its hardware portfolio. **Page 19.**

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▶ MFJ NEWS

DOJ report seen as BOC boon

May deliver OK for manufacturing.

BY KARYL SCOTT
Washington, D.C. Correspondent

WASHINGTON, D.C. — An unreleased report currently circulating within the Department of Justice's Antitrust Division may lead to a loosening of the Modified Final Judgment, allowing Bell operating companies to manufacture telecommunications equipment.

Findings of the so-called "Huber Report," commissioned by the Department of Justice in December will be incorporated in Justice's own January report to U.S. District Court Judge Harold Greene, who currently oversees the Modified Final Judgment.

MFJ assessed

The Huber Report was designed to assess the Modified Final Judgment's impact on the deregulated telecommunications industry and will likely influence the Justice Department's recommendations to Greene.

While the Justice Department has released neither Peter W. Huber's findings nor its own recommendations, a former Justice official said he expects Huber to be most explicit in the area of manufacturing.

"I think he will recommend a lessening of the restrictions on manufacturing," said the official, who asked not to be named. The Modified Final Judgment has thus far restricted the BOCs from entering manufacturing, information services and long-distance telephone markets.

"I think he will be less sanguine on interexchange and information services," the official said.

"He'll probably take a more analytical approach to these markets, weighing the factors of competition and bypass."

Special Advisor to Justice

Huber, a former associate professor of mechanical engineering at the Massachusetts Institute of Technology, was hired by the Department of Justice as a special advisor. Huber was a research fellow at Harvard University's Kennedy School of Government, a law clerk to Supreme Court Justice Sandra Day O'Connor and a consultant to the Brookhaven National Laboratory.

Huber spent the better part of this year conducting interviews with BOC officials and other participants from a wide cross-section of the telecommunications equipment and services business and government agencies.

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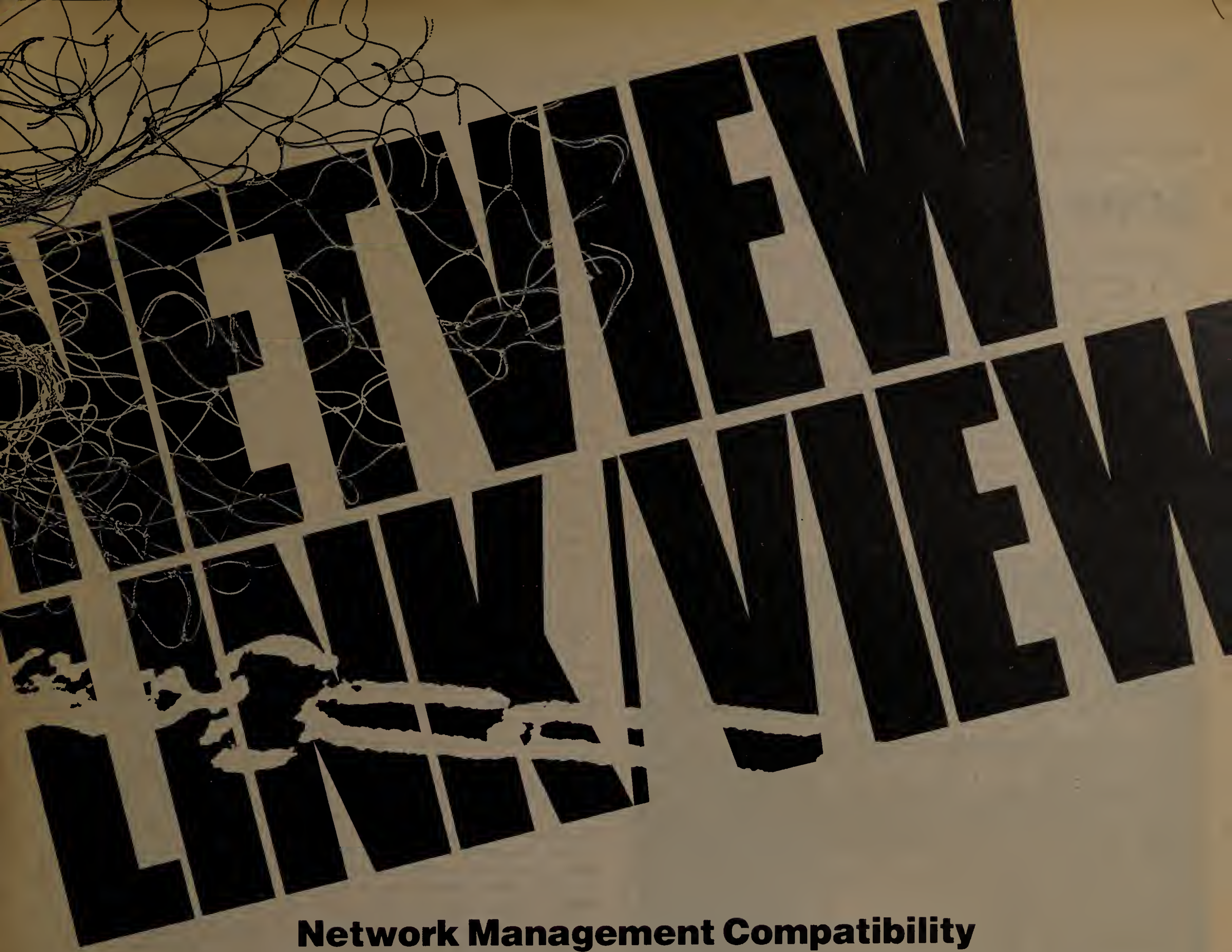

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▶ COMMUNICATIONS CLOUT

State users wield power

SEATTLE — State telecommunications directors are poised to wield their buying power to steer networking standards, according to members of the National Association of State Telecommunications Directors (NASTD), which held its annual conference here last week.

The directors, who manage large statewide networks, said their purchasing power will provide them with plenty of influence over vendors implementing communications standards. Although the conference was closed to the press, *Network World* spoke to NASTD's top officials.

"We are the largest customer in our state," said Allan Tolman, California's director of telecommunications. "Any move we make will be felt by the operating companies."

State telecommunications directors complained that in the past, equipment vendors dictated wiring and cabling schemes within state buildings, thereby limiting equipment choices.

Now the directors say they are seeking greater vendor participation in next year's conference in order to give users a chance to air their concerns.

"There is no lack of products to choose from," Tolman said. "But we are still vendor-driven, and we shouldn't be. Next year, we will ask vendors to take an active role in the conference so we can establish a two-way dialog."

According to Al Talbott, Illinois telecommunications director and current NASTD president, association members are typically state telecommunications directors who oversee the multiple voice, data, video and two-way radio communications networks that link various state departments.

"Although each state has a different system of delegating responsibility," Talbott said, "they all have the same goal of centralizing control over communications. That helps us obtain maximum volume discounts for all of the individual state agencies."

Tolman said past NASTD conferences have focused primarily on the products and services used by each state. State directors are now shifting that focus to strategic planning and network management.

George Christenberry, Georgia's director of telecommunications and NASTD president-elect, observed that like most communications directors of private corporations, state telecommunications directors got more responsibility after divestiture. "[Deregulation] gave us a chance to save money and exercise more technical options," he said.

However, strict cost control and slow government procurement procedures pose management challenges not faced by communications managers in private business.

State governments are asked to provide the same communications technology that is available in most corporations, but the public is sometimes unwilling to pay the high salaries needed to hire the communications talent required to run the nets, according to Tolman. In that regard, he added, divestiture was traumatic to the states.

"Telephone companies once provided most of the technical communications support," he said. "Now our support staff from the phone company is reduced, and it is hard to fill the vacant positions. We had to create our own training program."

State agencies are avid supporters and users of most available communications technology. However, most of their product choices remain somewhat conservative compared to so-called leading-edge users. "We have an obligation to see that the public is not a testing ground," Tolman said. "We can't risk the taxpayer's service."

North Carolina's Rule added that state directors also have the challenge of coping with newly elected government officials, who may appear approximately every four years and may alter the director's overall strategic plan. "The new government may decide it wants to place its emphasis on a project other than communications technology," he observed. ◘

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Box 9171, 375 Cochituate Road
Framingham, Mass. 01701-9171
617/879-0700

Editor
Bruce Hoard
Managing Editor
John Gallant
Features Editor
Steve Moore
Associate Editor
Lisa Guisbond
Senior Editors
John Dix, Paul Korzeniowski
Pamela T. Powers
Senior Writers
Margie Semilof, Bob Wallace
Staff Writers
Michael Fahey, Nadine Wandzilak
New Products Editor
Jim Brown
Washington, D.C. Correspondent
Karyl Scott
1273 National Press Building
529 14th Street NW
Washington, D.C. 20045
West Coast Correspondent
Mary Petrosky
3350 West Bayshore Road
Suite 201
Palo Alto, CA 94303
Assistant Features Editors
Christine Casatelli
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▶ TRANSPORTATION

Nationwide rail network chugs along

Train II maps moves of 2 million cars.

BY NADINE WANDZILAK
Staff Writer

WASHINGTON, D.C. — Forty of the nation's largest freight carriers are working the rails electronically on Train II, a national network designed by the industry's trade association to streamline the exchange of information.

From its nerve center here, Train II supports two primary applications — rail freight tracking and message switching, according to Henry Meetze, president of Railinc Corp., which operates the network. Railinc is a 4-year-old subsidiary of the Association of American Railroads. While the network was originally intended to serve railroads, it now also services other users, including shipping companies and the three largest U.S. automakers.

Through dedicated lines to two IBM mainframes housed at the hub center, 40 major railroads access Train II's data bases, which contain information on the movement of more than two million freight cars, trailers and containers as they ride along 300,000 miles of track owned by some 500 railroads.

"From three dial-in circuits in 1970, Train II evolved into a point-to-point star network of 40 users," Meetze explained. Most of those users are located in the Eastern half of the U.S. "We're concentrated there because the net is based on the location of the railroads' corporate headquarters," Meetze said.

The net also connects two Canadian lines — Canadian National and Canadian Pacific — and the National Railway of Mexico.

The railroads automatically submit information, many on a real-time basis, on rail cars operating on their tracks, explained Mike Robinson, telecommunications manager for Railinc. "We process that information twice a day. Then we deliver it to the rail car owner."

Train II's Freight Car Master data base contains each freight car's last four reported moves. Another data base, the Car Service Data Base, allocates cars between railroads in time of a car shortage. A third, Universal Machine Language Equipment Register, is Rail-

See **Railinc** page 55

▶ AUTOFACT

Factory forum changes

BY BOB WALLACE
Senior Writer

DETROIT — The Autofact conference, long considered the domain of machine tool and factory automation gear vendors, is undergoing a metamorphosis.

A sign of the changing Autofact landscape was that office networking giant Digital Equipment Corp., regional Bell operating company Ameritech and several fiber-optic local-area networking vendors infiltrated the ranks of the manufacturing moguls at the Autofact '86 show here last week.

While DEC used the show as a platform to launch Manufacturing Automation Protocol-compatible networking products, Ameritech, FiberCom, Inc., Artel Communications Corp. and Codenoll Technology Corp. attended the Motor City manufacturing meeting with the aim of persuading factory networkers to adopt alternative communications strategies.

Ameritech, with its mammoth wide-area factory networking exhibit, was the only RBOC exhibitor at the meeting. It worked to interest users in its central office-based data communications services as a means of connecting multiple manufacturing facilities.

Dave Tompset, product management staff manager with Michigan Bell, claimed the BOC wanted to eliminate users' perception of the company as strictly a voice communications services provider. "One of our division managers attended Autofact '85 and told us 'those are our customers, why aren't we exhibiting at the show?' " Tompset related.

Gene Dunne, product development manager for Ameritech Services, said one third of the firm's customers are manufacturing companies. "Not all manufacturers have the luxury of acquiring a systems integrator to handle interplant communications needs," Dunne said in reference to General Motors Corp.'s acquisition of Electronic Data Systems Corp.

Dunne said Ameritech is working to position itself as a company that can solve user networking problems both inside and outside the walls of the factory. Ameritech's wide-area factory networking demo enabled remote users to communicate with devices attached to a MAP-compatible factory net through each of Ameritech's Business Network services.

Devices hooked to the factory net communicated with equipment at remote locations using Ameritech's data-over-voice and high-speed digital communications services. Services were provided across the RBOC's packet-switched network.

Dunne predicted that experience from creating the mini-factory demo, coupled with relationships developed with vendors that donated the factory gear to the effort, would one day enable the company to offer manufacturing systems integration services.

Michigan Bell's Tompset said the company is interested in offering products and services to solve users' factory floor application problems. The Second Computer Inquiry, however, requires all BOCs to offer customer premises equipment through a separate subsidiary.

Fiber-optic network vendors FiberCom, Artel and Codenoll pitched their existing fiber-optic cable-based local nets to users as viable alternatives to broadband, coaxial-cable-based factory systems. Although both GM and Ford Motor Co., leading factory systems implementers, have begun to outfit their plants with broadband coaxial nets, these vendors maintain there is a place for fiber on the factory floor.

Albert Bender, president of FiberCom, predicted fiber-optic cable systems will be used as single-channel sub- or carrier-band nets. These nets, which would hook factory floor devices to a cell controller, would in turn be linked to broadband backbone nets of the type installed in many automakers' plants. "The real home of fiber is in the factory at the subnetwork level," Bender proclaimed.

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▶INTERNATIONAL TRADE

FCC flexes muscles in European market brawl

BY KARYL SCOTT
Washington, D.C. Correspondent

WASHINGTON, D.C. — The Federal Communications Commission is threatening to use its authority over the Bell operating companies' equipment procurement practices in order to bar Siemens AG of West Germany from the U.S. telecommunications market.

FCC Chairman Mark Fowler said last week that his agency would begin a rulemaking on BOC equipment procurement as a way of determining what authority the FCC has over foreign equipment manufacturers doing business in the U.S.

The BOCs currently buy telephone switching gear from a variety of domestic and foreign firms. A rulemaking allows input on a topic from all interested parties. It is designed to establish a policy.

While Fowler said the proposed rulemaking is not an attempt to bar any foreign company from doing business in the U.S., observers see the move as retaliation against Siemens and the West German government.

The international sparring match resulted from France's sale of state-owned Compagnie Generale des Constructions Telephoniques (CGCT), which controls 16% of the French switch market.

AT&T, along with European partner N.V. Philips of the Netherlands, had agreed to buy CGCT, but the West German government began pressuring the French to sell the company to Siemens. Since then, Italy, Britain and Sweden have also entered the fray on behalf of their telecommunications companies, and the French have reopened the bidding.

It is widely believed that Fowler is acting in concert with the U.S. Departments of Commerce and State, the U.S. Special Trade Representative and key members of Congress to put down escalating telecommunications trade problems with West Germany.

Whether or not the FCC has influence in foreign trade issues remains to be seen. Fowler said the FCC is not expert on issues of international trade, but he also noted the agency has authority over the issue of free and fair trade when it affects the public interest.

"The FCC has the authority to address BOC telephone equipment procurement," said FCC Common Carrier Division Chief Bert Halprin. "The FCC initiated a rulemaking into BOC procurement practices prior to deregulation but decided not to pursue it after deregulation.

"Both the FCC and the state [Public Utility Commissions] have control over the costs the BOCs put into the rate base as well," Halprin said. The FCC could call upon public interest and national security standards in examining BOC foreign equipment purchases, he said.

Many observers say they believe Fowler is exerting more authority than the FCC legally has. Others believe the U.S must take a stand against foreign trade impediments.

"The FCC is being used as a tool by the administration," said telecommunications consultant George Dellinger of the Washington Analysis Corp. "AT&T is getting beaten up in this market by foreign competition. The West Germans haven't allowed U.S. companies into their market, and I think this is a sign that the U.S. is starting to play hardball. Our government is not going to allow Siemens to become the third largest switch manufacturer in the world."

A recent letter from Nynex Chairman D.C. Staley to Fowler pointed out an additional problem. Staley indicated most of the Siemens gear his firm bought had been manufactured in the U.S. by Siemens' U.S. subsidiary, an arrangement that will compound the jurisdictional debate.

▶AUTOFACT '86

DEC closes MAP net gap

BY BOB WALLACE
Senior Writer

DETROIT — Digital Equipment Corp. drew close to completing its Manufacturing Automation Protocol factory networking product line at the Autofact '86 conference here last week with the introduction of equipment that will hook any VAX Unibus and VAXbi processors under VMS to a MAP local net.

DEC was the only vendor to unwrap MAP network products at the automation show here. Although DEC's VAX DEC/MAP line appears complete, a DEC spokesman said the company is working with Concord Communications, Inc., to develop a board-level interface that would enable certain Q-bus-based Micro PDP11s, VAX stations and MicroVAXs to be tied to a MAP network.

The VAX DEC/MAP equipment will be commercially available in January, while the Q-bus interface device is not expected to be unveiled until the spring, a DEC spokesman said. VAX DEC/MAP consists of three offerings: a VMS-based software package with four application layer interfaces and network management features, a communications controller, and cabling. DEC said its computers require a Concord Communications' MAPserver/Plus Token Interface Module (TIM) to connect to a token-passing bus MAP network.

The new applications include:

- The File Transfer Access Method, which allows virtual circuits to be established between local and remote applications running under the VMS operating system. Files may be transferred in either ASCII-text format or as any unstructured binary data stream.
- Common Application Services Elements, which provides for program-to-program or peer-to-peer communications between cooperating processes in a MAP network.
- Manufacturing Message Format Standard encoder and decoder, which provides message formats for programmable controllers, numerical controllers and robots.
- Directory Services/Client Services Agent (CSA), which provides rudimentary name-to-address resolution. CSA provides the physical adresses on the MAP network for a specified application program.

The controller product, dubbed the KMS-1P, links the VAX DEC/MAP software residing on the computer to the Concord Communications TIM. The single-line controller implements the X.25 LAP-B protocol over an RS-422 line between the VAX and the TIM.

The new products, which implement the MAP Version 2.1 specification, have not been tested for conformance with MAP standards at Industrial Technology Institute, an Ann Arbor, Mich.-based firm.

Users of DEC's DEC/Net local nets can hook these baseband Ethernet systems to a broadband Ethernet system with DEC's previously announced LAN Bridge 100 and a broadband Ethernet modem manufactured by Chipcom, Inc. DEC inked OEM pacts with both Concord Communications and Chipcom earlier this year. These products allow DECnet users to operate a MAP net and a broadband Ethernet simultaneously on separate channels of a single coaxial cable.

The VAX DEC/MAP products range in price from $12,000 to $16,500. The Concord Communications' MAPserver/Plus TIM is priced at $5,745.

Chipset from **page 1**

come standard components within personal computers.

Currently, network connections cost close to $700. Most users tie microcomputers into a local net through adapter cards that require a full-size computer expansion slot.

Vendors are working to decrease the size of these adapter cards, which are used with various network topologies. A handful of vendors, including Digital Equipment Corp., are working to reduce the size of the Ethernet chipset.

Texas Instruments, Inc. has embarked on a two-step plan. The first step will be to shrink the chipset so it fits on a half-size expansion card. That capability should be available next year.

The second phase, which will not be completed until at least 1988, will involve modifying the chipset so it can be housed on a personal computer's motherboard, which contains core processing components.

Shrinking the size of a chipset offers two benefits. The smaller chipsets require less circuit space, reducing production costs by as much as 50% for OEM suppliers such as TI. The OEM can then pass these reductions on to the local-area net vendor who, in turn, can cut the cost of adapter cards.

The lower priced components also offer vendors additional product design and marketing options. For example, DEC opted to provide an Ethernet connection as an integral component of its new personal computer, the VAXmate. Analysts expect other vendors to follow DEC's lead.

The trend toward low-cost connections will blur lines that have separated local networking vendors from personal computer vendors. Some networking vendors have decided to try to go head to head with personal computer makers.

Recently, a few vendors announced diskless workstations, essentially personal computers without floppy-disk drives. By developing these products, networking vendors are able to spread their production costs over two network components: adapter cards and workstations.

Spreading costs over two items will enable vendors to cut prices drastically and also to pressure competitors, who may not be selling both items, to follow suit. Currently, adapter cards are priced at close to $700. Analysts expect the price of the cards to drop to less than $400 in the coming months.

Diskless workstations and integrated networking capabilities have thus far been limited to Ethernet networks. "Ethernet is a more mature technology than the token ring," said Norm Meisner, vice-president at Cullen & Meisner Associates, Inc., a consulting firm in Newton, Mass.

But analysts expect similar capabilities will become available for token-ring nets. Some analysts speculated IBM is experimenting with a product resembling the VAXmate. The company is reportedly developing a microcomputer, based on an Intel Corp. 80386 microprocessor, that would boast an integral Token-Ring Network connection.

That approach could benefit IBM in a couple of ways. First, the microcomputer could help boost IBM Token-Ring Network sales. Second, it would force IBM Personal Computer clone manufacturers to move into the networking business.

The shift could also pressure networking vendors. Howard Frank, president of Howard Frank Associates, Inc., a Washington, D.C. consulting firm, said networking vendors whose revenue comes primarily from adapter board sales will be hard-pressed as the market changes.

Those whose income comes principally from software will likely fare better.

▶ WIDE-AREA NETWORKS

Bank integrates applications thriftily

BY MARY PETROSKY
West Coast Correspondent

SEATTLE — Seattle First Bank and PacTel InfoSystems last week released details on the installation of a wide-area data network that has allowed the bank's 155 branches to combine four different applications over the same transmission medium at a substantial cost savings.

The Doelz Networks, Inc.'s External Network Management System was the key in building the integrated network, which saves Seattle First $70,000 in telephone bills each month, said Gary Scroggs, the bank's assistant vice-president and manager of network utilities. PacTel Connection, a division of PacTel InfoSystems, was contracted to augment Scroggs' staff of six. The group helped with network design, costing, central site layout and project management, Scroggs said.

Early in 1985, the bank faced the possibility that it would need four separate networks costing an estimated $250,000 per month in telephone bills, Scroggs explained. As a result of a major upgrade in computer equipment, each of the bank's four applications — automatic teller machines (ATM), administration, cash management and security monitoring — required a different protocol and transmission speed.

Prior to overhauling its computer equipment and network, Seattle First had managed to consolidate all but the security application on its net. The bank had Honeywell, Inc. mainframes at its central office and a minicomputer at each branch. The minicomputers supported the ATMs, cash management and administrative applications, and were linked to the central network via a multidrop line operating at 2,400 bit/sec.

> *"The net costs $4m to build."*

Two forces drove the change in the network. One factor was the bank's decision to move to a new data base management system, which resulted in the swapping of its Honeywell equipment for IBM mainframes running IMS. Rather than purchase IBM 3170 terminals, however, the bank opted to buy approximately 2,000 Apple Computer, Inc. Macintoshes for its branch offices, Scroggs said.

About the same time, Seattle First committed to participating in a shared ATM system with a consortium of other banks. This required the bank to change its proprietary ATM system to be compatible with the other banks' systems, and the bank installed a system from Tandem Computers, Inc. Complicating matters further, the bank's security group indicated it wanted to coordinate all alarm monitoring over the network.

Commenting on the diversity of protocols and transmission speeds that needed support, Scroggs said, "We had to rebuild what had been in place for 10 years. We were incapable of forcing any growth out of [the old network]." Scroggs and his staff evaluated a variety of multiplexers, but found that none "had the performance characteristics we were looking for." The Doelz system, which he described as a packet-switching multiplexer that uses a proprietary protocol, provided the solution. The equipment the bank purchased consists of a hardware switch at its main site and individual boxes with four to 16 ports at each branch site.

"The product moves all protocols and transmissions through the network equally effectively," Scroggs said. The Doelz system also allows the bank to prioritize data transmission according to the data's importance to the bank's operations. Users set priorities by ports, said Scroggs. The bank is using leased lines for transmission, combining 56K bit/sec hubless AT&T Dataphone Digital Service and 9.6K bit/sec analog services.

PacTel's principal role was to manage the configuration and design of the bank's network control center, Scroggs said. The group also helped configure the overall network, which involved working with 17 independent telephone companies.

Not including the cost of the Macintoshes or IBM 3274 controllers, the network cost between $3.5 and $4 million to build, Scroggs said. Although the investment seems high, the bottom line has been lower phone bills than would otherwise be possible. ☑

More news: page 53

▶ DMW CONFERENCE

AT&T touts ISDN applications to still-skeptical customers

BY MICHAEL FAHEY
Staff Writer

NEW YORK — Although AT&T restated its commitment to Integrated Services Digital Network and said it will file ISDN tariffs next year, users attending DMW Group, Inc.'s World Update conference here last week expressed doubts about the near-term importance of the much-touted new technology.

Speaking at the conference, Roy Weber, director of AT&T's Bell Laboratories, confirmed AT&T's earlier announced plan to file ISDN tariffs with the Federal Communications Commission in late 1987. Weber added that the timing of the filings is subject to change because of "business reasons." However, he would not divulge what those business reasons might be. (See related DMW story, Page 55.)

The initial AT&T ISDN service offering will enable users' equipment to identify the origin of incoming calls by using ISDN's signaling channel to pass the calling party's identity on to the user.

AT&T's Advanced 800 service boasts a similar capability but is based on an aging signaling technique.

Weber cited several possible applications where the ISDN caller identification feature could increase call routing efficiency.

For example, an airline or travel agency could identify a caller by telephone number and, based on former experience with that client, route him appropriately, perhaps to an agent handling international travel.

Users at the conference said Weber's potential application was interesting, and several agreed that ISDN holds promise but added that they were looking for more immediate solutions to their telecommunications needs.

Rosemary Baer, vice-president of communications at Manhattan, N.Y.-based Chemical Bank, was skeptical about the ability of local exchange carriers to deliver ISDN to the local loop.

"You are saying you can do the job," Baer told Weber during his talk. "What I want to know is whether anyone can get ISDN into the local central office.

"The BOCs are the major cause of network problems," Baer said. "For us, the Nynex local loop is the biggest point of failure."

Baer said she has to base her network plans on her organization's needs, rather than on "some artificial wish for a future service."

Bell Laboratories' Weber said the BOCs have differing ISDN implementation strategies, with some companies pursuing the new technology more ardently than others.

He said AT&T is willing to work with the BOCs to provide ISDN to users, and the company is also willing to work to provide ISDN to private networks that bypass the local loop.

Gary Praderelli, division vice-president of information systems at Walgreen Co., said ISDN is an interesting concept and a potentially valuable technology. But, he added, ISDN services will not be useful for his network, which links more than 1,400 sites, until they become widely available.

Praderelli said his company's network stretches from San Juan, Puerto Rico, to San Francisco and, for at least the near future, Walgreen will continue to fulfill its goal of low-cost, high-quality service through very small aperture terminal satellite technology.

Jerry Mayfield, president of professional services for DMW Group, said there are two major tasks confronting ISDN proponents. The first task, Mayfield said, is to make clear the benefits ISDN will offer users. The second is to make ISDN truly ubiquitous. "Pockets of ISDN will not work," he added. ☑

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INDUSTRY UPDATE

> “In the telecommunications industry, it seems that little but the past is certain. A powerful trend, however, is consolidation. We see a number of factors, including growing economies of scale in product development and manufacturing, sluggish demand, heightened competition and just plain too many suppliers, leading to industry rationalization, particularly in the U.S. As the industry undergoes this natural phase of development, only a handful of suppliers may emerge as prosperous survivors.
>
> **Equity Research**
> The First Boston Corp.
> New York

▶ ANALYSIS

M/A-Com continues cutbacks

Cost paring goes on; firm's CEO resigns.

BY PAM POWERS
Senior Editor

BURLINGTON, Mass. — Still reeling from a series of decimating blows, M/A-Com, Inc. has shed yet another division, known as Information Systems, the company's chief executive officer recently resigned, and it may now consider the sale of certain product lines.

The data private branch exchange line is reportedly the first target for budget cuts. M/A-Com is seeking rejuvenation through a tightly trimmed operation and a new CEO, but its ultimate fate is a matter of serious question.

M/A-Com finalized the sale of its Information Systems division to Centel Corp. for approximately $85 million. The division marketed data communications systems purchased from other vendors, to which they added software and installation services. According to a company spokesman, that division, although profitable, did not fit in with M/A-Com's new business strategy.

That strategy is to focus on manufacturing and marketing commercial telecommunications and defense electronics to the exclusion of all else. But the data PBX product line, which falls under the aegis of telecommunications, has also come under fire. “We are seeking no new customers for that product,” said Charles Christ, vice-president of marketing. “Other things are in negotiation now.”

Christ would not divulge future plans for the data PBX line, but industry sources think the company may sell it. The spokesman said that while he expects future asset sales to be nowhere near the magnitude of those just completed, he thinks M/A-Com may later sell off certain product lines.

The acting CEO, Frank A. Brand, has faithfully executed M/A-Com's revamping plans since February of this year. In the midst of these changes, Chairman, President and CEO Richard T. Dibona resigned due to ill health. Brand has stated he is not a candidate for the position. As a result, the company will conduct a nationwide search for a new CEO.

▶ TAKEOVER TRY

T-Bar fights off hostile acquisition

BY PAM POWERS
Senior Editor

WILTON, Conn. — T-Bar, Inc., saddled with debt and poor investor ratings, is now trying to fend off a hostile takeover attempt by JBC Acquisition Corp. Despite the fact that T-Bar's revenue far exceeds that of its pursuer, and despite the fact that T-Bar has retained a top law firm and two financial advisors to save it, the company is fighting with one hand behind its back.

JBC is a closely held concern of John Beall and Co., Inc., a maker of data switching equipment with annual sales of approximately $3 million. Beall started buying shares in August; by the end of October, it amassed some 16% of common stock and convertible debentures. Recently, Beall made an offer of $49.5 million for control of T-Bar.

Last week, the the T-Bar Board of Directors deemed the Beall offer inadequate and said it will seek an alternative course of action. There is speculation it will seek a white knight.

Forty-five percent of T-Bar's fiscal 1985 revenue was generated by data communications equipment. This line consists of mechanical, electromechanical and matrix switches, manual patch panels and network management systems. The company derived its reputation from simple, low-end management products and has remained strong in that area. But the patch panel and mechanical switch markets are mature; most users have graduated to more sophisticated systems for control and management, and in those areas, T-Bar has lagged behind the competition.

Matrix switching is one area in which T-Bar has invested considerable sums of money to achieve success. In many ways, its efforts are laudable. The new generation of matrices — dubbed Galaxy and Monolith — represented, in many areas, unprecedented state-of-the-art capability when they debuted. A new industry trend developed, as square architecture gave way to distributed architecture. The line met with much critical acclaim.

But apparently, problems are brewing just beneath the surface. It appears Galaxy was announced prematurely; many industry insiders say the company wasn't prepared to deliver on schedule. In the interim, some of the competition has caught up. Now there are rumors T-Bar is slashing prices to win accounts, and the company's poor financial condition can't withstand overly slim profit margins.

Evidence suggests similar problems developed with the company's attempts to launch a network management system. A few years back, T-Bar announced its purchase of the French company TITN, Inc.'s management system, but plans never quite got off the ground.

T-Bar's strength is its technology. With a secure cash position and some expertise in marketing, the company could leverage that technology and compete effectively in the matrix market, at least. But, as T-Bar undoubtedly realizes, John Beall and Co. doesn't sound like the ideal candidate to pull T-Bar from the snowdrift. Although the product lines are complementary, Beall is small and virtually unknown.

In a perfect world, T-Bar would be acquired by a healthy company with a wide range of networking and management products. Chances are the results will be less than perfect.

A consolidated statement of earnings* for T-Bar, Inc. and subsidiaries (unaudited)

	Six months ended	
	June 30, 1986	June 30, 1985
Net sales and lease revenues	$20,729,000	$19,586,000
Gross profit	$10,622,000	$ 9,382,000
Net earnings	$ 504,000	$ 396,000

* This statement is adjusted for the 5% stock dividend declared April 30, 1985.

SOURCE: T-BAR, INC., WILTON, CONN.

VENDOR VIEW

JAMES C. HAHN

Building toward a global net

First of a two-part series.

Faced with unfolding digital network services and a myriad technical challenges and unsettled standards issues, today's network manager plays a critical role in providing corporate communications services.

To reap the benefits of emerging integrated voice, data and video services, the network manager must convince corporate leaders to implement transitional communications plans now that will ease the migration toward service integration and end-to-end digital connectivity.

To accomplish this and to lay the groundwork for global networking, an evolutionary approach must be taken from both a technical and operational viewpoint. From the network manager's perspective, the first step in this process is to assess the current network and plan how to economically and reliably concentrate primary voice/data links onto standardized T-1 backbone networks operating at the T-1 1.544M bit/sec rate.

By concentrating critical voice/data traffic over standardized, high-speed T-1 transport links, the corporation essentially becomes its own communications provider. For that reason, the real challenge is finding the appropriate T-1 product to support present needs and accommodate future growth. With the right T-1 multiplexer installed

See **T-1** page 10

Hahn is president and chief executive officer of Infotron Systems Corp.

T-1 from **page 9**

at the customer premise location, the network manager can take advantage of emerging Software Defined Network services and combine these with new integrated services digital network offerings, as they become available.

Competition in the T-1 marketplace has dramatically intensified in response to increased industry demand, the growing availability of low-cost transmission facilities and an expected decline in bandwidth pricing and T-1 tariffs.. Explosive market growth complicates the network manager's job; a barrage of new equipment offerings provides varying levels of functionality at different prices.

In promoting the corporation's role as its own communications provider, the network manager must evaluate T-1 multiplexers using a set of critical selection criteria such as AT&T compatibility, operating flexibility/system redundancy and software control/network management.

Compatibility with AT&T's formats and network services is paramount. In particular, products must comply with the current D4 framing and, in the future, with Extended Superframing Format standards, the line format proposed by AT&T for use on T-1 lines.

It's important to understand and comply with the industry standards such as DSO time-slot channelization, the common terminology for a simple 64K bit/sec channel; and DS1 framing, which refers to a composite T-1 carrier that multiplexes 24 channels into a single 1.544M bit/sec bit stream.

The use of AT&T-compatible T-1 multiplexers means that corporate users can derive 24 channels of whatever service they want, including switched services such as common business lines, WATS services, switched data services or private-line services. Currently, AT&T, MCI Communications Corp. and US Sprint Communications Co. are providing bulk services that are based on T-1 facilities.

Therefore, users can select a bulk discount, outgoing, long-distance calling service, such as AT&T WATS, US Sprint Dial-1 or MCI Prism III, on the basis of service needs and competitive rate structures. These services are delivered to the user on a T-1 multiplexed facility. This is known as "T-1 Primary Access."

In addition, further cost savings and performance improvements can be realized by using value-added services such as AT&T's Megacom, Megacom 800 and M24 service. Through M24, for example, up to 24 voice or data channels originating at different locations can be consolidated, which often provides significant cost savings.

Another advantage of AT&T compatibility is universal access to AT&T's Accunet T-1 services including Customer Controlled Reconfiguration (CCR). CCR makes use of AT&T's Digital Access Cross-Connect System equipment and allows users to route DSO time slots to different locations. By incorporating a backup capability like Accunet Reserve into the overall corporate disaster recovery plan, the network manager can divert an entire data stream over another facility in the event of a link failure.

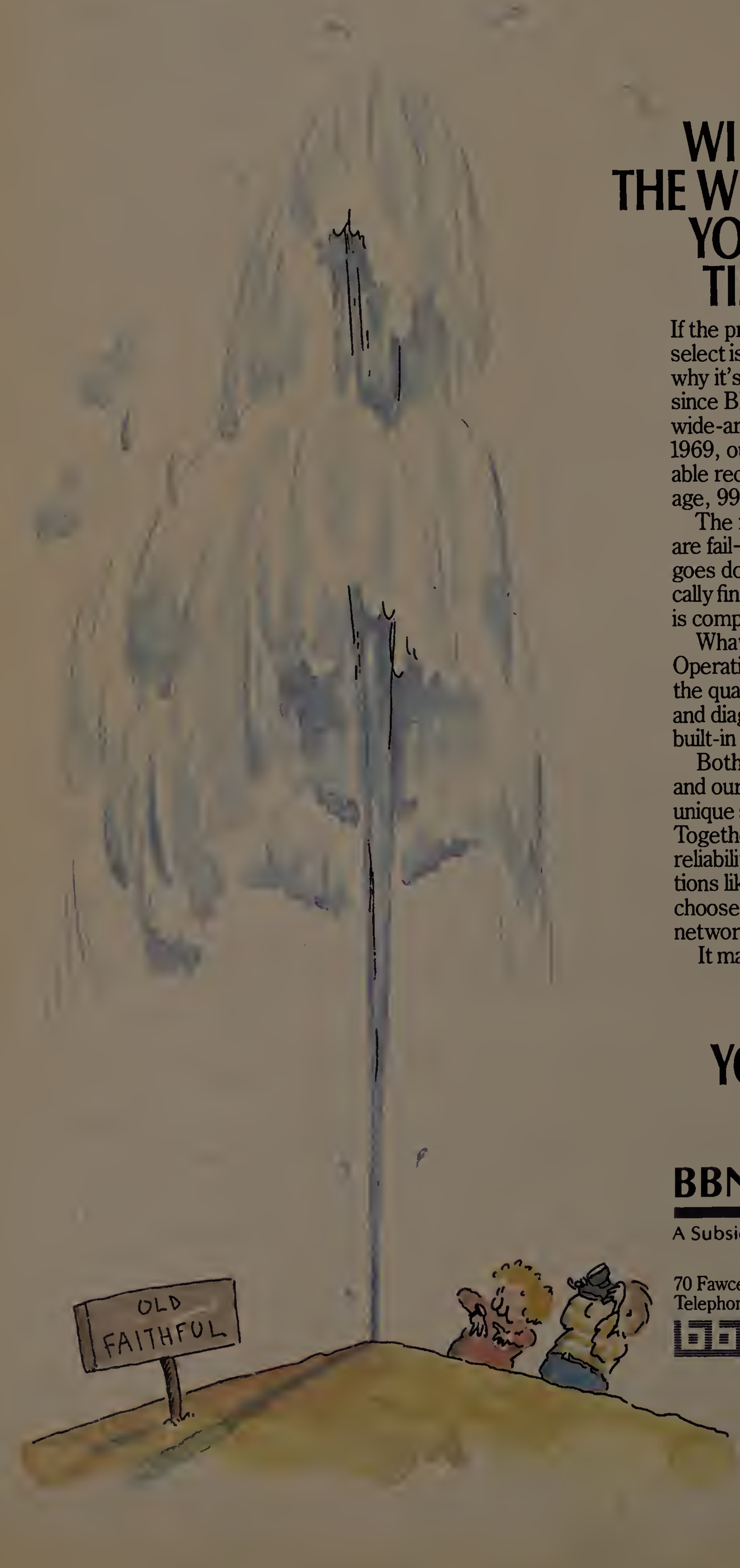
Flexible, soft-controllable T-1 multiplexers make the most of M24 and CCR user benefits through a simple user interface. As network services grow in size and sophistication, it will become more important to define channels, adjust transmission levels, activate unused channel cards and perform diagnostics, among other things, right at the network manager's console.

Instant provisioning, a key advantage provided by high-speed T-1 networks with present and planned service offerings from various carriers, puts the network manager in full control of the communications network. For example, once the T-1 facility is in place between the corporation and the central office, DSO channels can be instantly requested, via the control channel, between the various facilities.

In the long run, software control and instant provisioning will result in further cost savings and operational efficiencies because all network resources can be dynamically allocated.

In this fashion, the network manager can divert entire or partial amounts of bandwidth as needed. Furthermore, the corporation will pay only for the amount of bandwidth that is required for a specific application. With circuit provisioning, overload situations and traffic fluctuations can be handled on a daily, weekly or monthly basis, efficiently and cost-effectively.

As ISDN networks are developed, using T-1 primary rate access, distributed control and advanced net management capabilities will be needed to support the larger variety of traffic and evolving service needs. Sophisticated network management systems will also provide single-point control, comprehensive diagnostics and comprehensive management reports. A flexible, evolutionary approach to networking is the key to managing tomorrow's technologies. ◘



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TELECOM TRENDS

Southern Bell swats junk phone calls

The Georgia Public Service Commission (PSC) recently approved a tariff filing by Southern Bell Telephone and Telegraph Co., which implements the Georgia PSC's regulation of automated dialing announcement devices. The tariff revision, already in effect, established strict rules for the operation of what are often referred to as junk phone calls.

▶ STATE REGULATORS

PUC staffs lack telecom skills

Work load puts training in backseat.

BY BOB WALLACE
Senior Writer

State public utility commissions (PUC) across the nation claim inadequate resources and lack of staff training have weakened their efforts to regulate communications equipment and service providers.

The role of the PUCs, once primarily to regulate pricing practices of electric, water, fuel and other public utilities, has expanded enormously in the communications arena. State legislatures have empowered these regulatory watchdogs to encourage competition among their states' telecommunications service providers.

But PUC staffers are woefully undereducated on the fast-changing industry. Personnel education often takes a backseat to more urgent needs.

Ronald Lehr, commissioner of the Colorado PUC, claims educating the group's staff of 93 is a major concern.

"We rely on filings, complaints from consumers, the trade press and seminars to educate our personnel," Lehr explained.

"At times," he continued, "we are overwhelmed by filings and complaints, and we have to priori-

See **PUC** page 16

Comparison of recurring charges for sample* T-1 special-access channels

State	Carrier	Present 5-mile	Present 75-mile	Proposed 5-mile	Proposed 75-mile	Change 5-mile	Change 75-mile
Arizona	MNTN	$638.29	$2,389.47	$1,045.58	$3,784.79	64%	58%
California	PACB	970.11	4,592.86	902.57	4,525.32	-7%	-1%
Florida	SBTC	1,343.74	5,029.67	1,081.62	4,417.01	-20%	-12%
Georgia	SBTC	1,125.22	4,211.32	942.20	3,799.98	-16%	-10%
Illinois	ILLB	1,323.37	4,696.67	1,242.28	4,182.28	-6%	-11%
Missouri	SWBT	1,055.85	5,782.95	946.60	5,184.40	-10%	-10%
New Jersey	NJBT	790.46	2,950.88	743.85	2,688.51	-6%	-9%
New York	NYTC	1,208.80	3,310.96	1,208.80	3,310.96	0%	0%
Ohio	OHIO	1,170.64	3,313.05	1,200.00	4,000.00	3%	21%
Pennsylvania	BTPA	892.09	3,570.51	760.76	3,392.21	-15%	-5%
Texas	SWBT	985.21	4,246.33	955.89	4,119.73	-3%	-3%

MNTN, Mountain Bell; PACB, Pacific Bell; SBTC, Southern Bell Telephone and Telegraph Co.; ILLB, Illinois Bell; SWBT, Southwestern Bell Telephone Co.; NJBT, New Jersey Bell; NYTC, New York Telephone Co.; OHIO, Ohio Bell; BTPA, Bell of Pennsylvania.

Special-access channel terminals are local telephone company-provided circuits that link customers to long-haul carrier networks. A long-haul T-1 point-to-point circuit includes four channel terminals: one between the customer's premise and the local telephone company's switch, a second line between that switch and the long-haul carrier, and two similar links at the other end of the circuit. Long-haul carriers pay the special-access channel terminal fees to the local telephone companies and pass the costs on to users in end-to-end tariffs. These rates were filed with the Federal Communications Commission in October and are expected to be acted on by December. (For more information on special-access channels see *NW*, Nov. 10, Page 11.)

* Sample rates are for a two-point, high-capacity circuit with no options.

SOURCE: ECONOMICS AND TECHNOLOGY, INC., BOSTON

CROSS TALK

BOB WALLACE

Legal wrangle awaits small users breaking AT&T leases

AT&T seems to be sending out a clear message to small users that have opted to terminate long-term AT&T equipment leases prematurely.

The message is: Pay up or we will see you in court.

A review of legal actions AT&T has taken against recalcitrant lessees reveals that the company has yet to win a termination charge court case against a large user.

AT&T has apparently chosen to go after the little guy, especially where fairly small sums of money are concerned.

For those who are not yet familiar with today's version of the Hatfields and McCoys feud, users have claimed that the equipment contracts they penned with their local telephone companies before the divestiture of AT&T are no longer enforceable because they were assigned to AT&T after the breakup.

AT&T maintains that a contract's a contract, and anyone who breaks one has to pay the fee specified in the contract for terminating the agreement.

AT&T was granted summary or stipulated judgments in cases against the following:

- Idaho Falls, Idaho School District, roughly $20,000.
- Central Controls of Missouri, $18,000.
- Yellow Cab of Charleston, S.C., approximately $8,600.
- Holiday Inn/CSI Associates of Georgia, $8,500.
- Group W Cable Television of Idaho, $8,000.
- Harte-Hanks Communications of Maricopa County, Ariz., figure not available.

An AT&T spokesman said damages in several other cases have not yet been determined.

Compared with the size of the termination charges faced by users that have contacted *Network World*, these figures are strictly small potatoes.

AT&T's case against the Cleveland-based Eaton Corp., which could represent AT&T's largest potential settlement to date, is still pending. If AT&T wins the case and is awarded the full termination tab, Eaton will have to shell out approximately $325,000.

The case is expected to go to trial in January 1987.

AT&T filed against Eaton more than 18 months ago.

See **Terminate** page 12

▶ VIDEOCONFERENCING

At the movies: new meeting service

STN's low-cost method bucks AT&T's two-way philosophy.

WASHINGTON, D.C. — Satellite Theater Network joined the ranks of companies hoping to strike it rich in the as yet unproven videoconferencing market.

Satellite Theater hopes to succeed by offering one-way videoconferencing services, while AT&T has focused its efforts on a two-way version of the service.

"The problem AT&T encountered was in offering two-way video, which is much more expensive than one-way," claimed Donald Farwell, vice-president of development for Satellite Theater.

"Another problem most videoconferencing firms have is small meeting rooms at hotels," Farwell said. "By using theaters, we can accommodate more people, making the per-person cost of the videoconference much lower."

Satellite Theater has agreements with five theaters in major cities to use their facilities during the daytime for business videoconferences.

Videoconferencing prices

The price per site for a videoconference is $1,900. If a customer holds two videoconferences per year, the cost goes down to $1,710 per site, and the charge for 10 conferences is $1,520 per site.

The firm estimates that there are about 700 one-way videoconferences taking place per year using the Holiday Inn HiNet network, college satellite networks and public television station networks.

The one-way videoconference is targeted at users intending to broadcast annual corporate meetings, educational programs, fund raisers or product introductions, all

See **Videoconference** page 12

▶ TELEPHONE SYSTEMS

Sears signs for call accounting

BY BOB WALLACE
Senior Writer

PEABODY, Mass. — Control Key Corp. recently signed a pact with Sears Roebuck and Co. for telephone accounting systems that will be used throughout Sears' individual market groups.

Harris-Lanier, a Control Key equipment dealer, will install and maintain the systems for Sears. Control Key, based here, said the PL Systems are available in three models: the low-end PL 75, the mid-range PL 150 and the high-end PL 300.

The call accounting systems monitor and analyze all incoming and outgoing telephone calls and print full reports on demand or automatically.

The reports are said to provide a variety of information regarding employee, department and companywide telephone usage.

The vendor claims the PL Series systems will work with other common carrier configurations including direct-trunk, dial-up and equal access.

The systems will reportedly also function with such trunk types as FX lines, local lines and WATS lines.

The Intel 8088 microprocessor-based systems are manufactured by Baldwin Special Products, a division of Baldwin Piano & Organ Co. Control Key says it has a call accounting system installed base of 1,000.

SMALL
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So, if you want small talk, talk to the competition. But if you have small groups of people who need to share information, talk to Gandalf. (312) 541-6060

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Terminate from **page 11**

The Federal Communications Commission made life difficult for AT&T when it remanded the issue of termination charges to individual state courts.

Since that time, AT&T won the Neal Berg case, in which a California court ruled members of Berg's consulting firm could not advise customers not to pay their termination charges.

AT&T was recently awarded the full amount, plus interest, of a contract terminated by Yellow Cab of Charleston, S.C. (See "Vendor hit for termination tab," *Network World*, Nov.3.)

The South Carolina court that heard the case also ruled in favor of Yellow Cab, which contended a Jarvis Corp. representative told Yellow Cab it would not have to pay the termination fee if it chose to end its long-term AT&T equipment lease.

In this case, Jarvis, a Washington, D.C.-based interconnect, was told by the court to foot Yellow Cab's termination tab.

Small, medium and large users from coast to coast have told *Network World* of their displeasure with the termination charge issue. Some small users have spoken of their intent to join together and take on AT&T in a class action suit. To date, there has been no word about whether such an action has been taken.

AT&T's strategy or battle plan for taking users to court over the issue is still unclear.

AT&T claims repeatedly it is not in the taking-people-to-court business. Litigation is merely a last resort, AT&T says.

The issue is one of principle, not of dollars and cents, an AT&T spokesman explained.

AT&T would not say if it plans to continue to take users to court to recover lease termination charges. In the meantime, small users faced with the issue are advised to proceed with caution. ☑

Videoconference from **page 11**

of which involve a few people disseminating information to large groups of people around the country. Satellite Theater will provide two-way audio for interactive communication.

Satellite Theater will kick off on Nov. 19 with a videoconference taking place simultaneously in Washington, D.C., Los Angeles, New York, Chicago and Atlanta. While the company has no customers as yet, "we have several tentative customers," Farwell said.

"We satisfied ourselves that the theater network was a viable concept after a market survey of videoconference producers showed they liked the concept and would use the network," said Satellite Theater President Ray Henry.

Satellite Theater will install 2.8-meter Ku-band antennas, made by Scientific-Atlanta, Inc., and Sony Corp. video projectors at the theaters. The equipment will be owned by Satellite Theater. The theater owners will receive a licensing fee for use of the facilities. ☑

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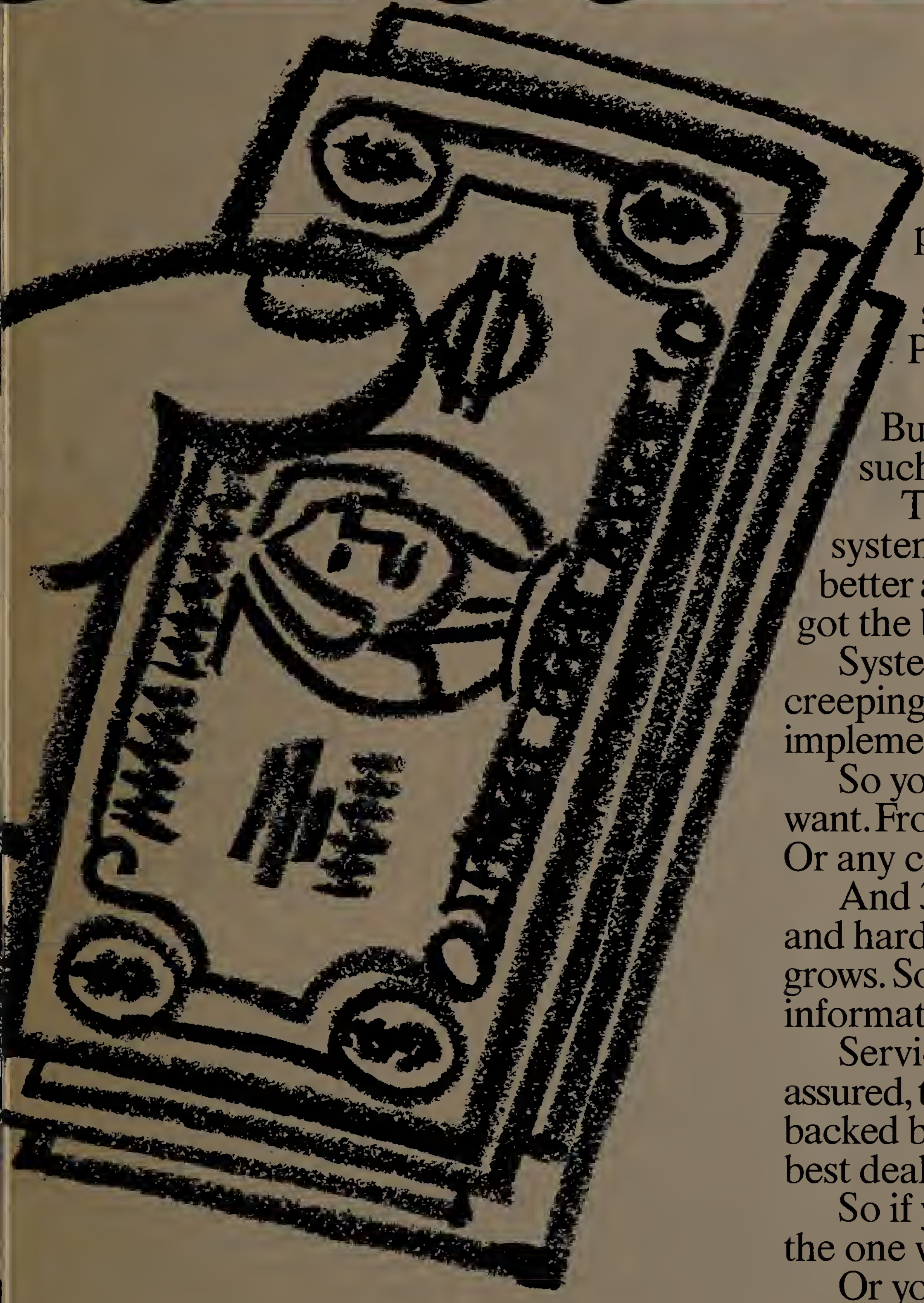

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BOC BRIEFS

SAN FRANCISCO — The California Public Utilities Commission has approved a provisional tariff for Pacific Bell to provide basic packet-switching services within its local access and transport areas.

The offering will support communications from one asynchronous device to another, between devices that support the X.25 protocol or from an X.25 device to one supporting the X.75 protocol.

The service will be available in the San Francisco and Los Angeles LATAs early next month, according to Dick Swoboda, Pacific Bell's director of public packet switching.

Pacific Bell filed a joint marketing waiver request with the Federal Communications Commission in January.

ATLANTA — BellSouth Enterprises has formed a new company, BellSouth Advanced Networks, Inc., to market enhanced services provided by BellSouth telephone companies, including dial access to packet switching and protocol conversion.

BellSouth Advanced Networks will offer asynchronous to X.25 and X.25 to X.75 conversions. The new company will be managed by BellSouth Enterprises Communications Systems, reporting to V.C. Jobson, Jr., group vice-president.

PUC from **page 11**

tize our problems. Staff training often takes a backseat to more pressing issues."

Private industry has depleted much of the pool of skilled telecommunications professionals, Lehr asserted.

"We have encountered problems recruiting against private industry," he said. The PUC is desperately trying to fill several telecommunications engineer posts, Lehr added.

The Colorado PUC commissioner said a series of roundtable discussions, task forces, special working groups and study groups have been established to help offset the problem of setting aside time for telecommunications-related seminars.

John Marks III, chairman of the Florida PUC, claims the group's telecommunications staff of 75 rides hard on both local and interexchange carriers and hammers out state policy on such issues as shared tenant services, tariff filings and rate cases.

Although the Florida PUC has the equipment necessary to perform these diverse tasks, Marks maintains his staff's knowledge of telecommunications must be improved.

"Although we have access to a tremendous amount of data concerning the companies we deal with, unless we have the educated staff who can utilize this information, the data is worthless," Marks said.

The level of sophistication of the PUC staff must be raised if the group is to properly regulate the companies it oversees, he added.

The Florida PUC chairman claims it is easier for the group to get funds appropriated for the purchase of data processing and communications gear than it is to have funds approved for hiring additional staff.

Brian Rude, a Wisconsin state senator, said the state legislature is uneasy about the level of telecommunications knowledge that the Wisconsin PUC staff possesses.

> *"Florida PUC Chairman Marks maintains his staff's knowledge of telecom must be improved."*

"We have some employees who have worked for the PUC for 25 to 30 years and have become insulated from what's happening outside in the real world," he said.

One PUC head claims disparity among the skills of PUC workers is worrisome.

"On one end of the spectrum, we have some junkyard dogs of regulation. If they show up at your company, they will find out everything they want to know," the regulator said.

"But, we also have some workers at the other end of the spectrum who are difficult to get a day's work out of," he added.

Steve Jennings, head of the Tele-Communications Association of Colorado, blasted the state legislators for their lack of understanding of the telecommunications industry.

"We discovered some legislators in Colorado didn't know what US West was," he said.

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Before you take the plunge, take a look at our cable-free alternative for connecting terminals.

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DATA DELIVERY

> “To most of our customers, the qualities of the company selling them a T-1 multiplexer are more important than the product's features. With T-1, users bet their business on their network. If the network is not available, then they have very serious problems.
>
> **Ed Botwinick**
> President
> Timeplex, Inc.
> Woodcliff, N.J.

FIRST USER

Late lines slow T-1 net tryout

BY PAUL KORZENIOWSKI
Senior Editor

ST. LOUIS, Mo. — The first user of a new T-1 multiplexer learned that installing a T-1 network involves more than selecting the appropriate multiplexer. After the company chose Amdahl Corp.'s T-1 multiplexers for its network, AT&T moved the installation dates for four promised T-1 lines back a few months, then a few years.

The case of Peabody Holding Co., located here, illustrates that even though AT&T has alleviated some T-1 delivery problems, there are still places where customers can only hope for delivery of T-1 lines. The AT&T maneuver was not catastrophic, but Peabody, a holding company for a number of coal companies, is still working to put in place the corporate network envisioned three years ago.

The company's net connects three central office buildings in St. Louis and satellite offices scattered throughout the country. The central office and satellite offices were tied to the network by a number of private point-to-point and multipoint lines operating at speeds of 4.8K bit/sec and 9.6K bit/sec.

Peabody calculated that it could, by using T-1, slash the long-distance phone bills at the St. Louis office by more than 60%. Alan Johnson, telecommunications manager at the company, said that an analog line between two St. Louis offices costs $90 a month and a comparable T-1 line costs about $186 a month.

In the original plan, the company wanted to install nine T-1 lines and link three St. Louis offices with offices in Evansville, Ind., Fairview Heights, Ill., Charleston, W. Va., and Henderson, Ken.

Rather than delaying network implementation until all T-1 lines could be cut over, Peabody decided to install five of the nine T-1 lines.

AT&T System 75 private branch exchanges with DS-1 interfaces, a standard T-1 interface, were used to link some locations to the network, and T-1 multiplexers were used at others.

The first step in selection of a multiplexer was taken when Peabody checked more than 20 products against a list of buying criteria. The criteria included software programmability, redundancy and compatibility with existing T-1 framing and formatting standards. In addition, the vendor's service team had to be able to respond to problems in remote locations.

The criteria helped narrow the potential suppliers to three manufacturers: Timeplex, Inc., Amdahl and AT&T, which was selling equipment manufactured by Tellabs, Inc. At the time, all three companies had new products in beta test. Timeplex was testing its Link/1; Amdahl was debugging its Multistar III; and AT&T was trialing the 735 T Mux.

During the second part of the evaluation, Peabody employees visited the various multiplexer user sites and talked with customers.

Johnson found that some advertised capabilities of Timeplex' Link/1 were still being developed. Timeplex also said it would announce another multiplexer, the Link/2. The fact that the company was announcing a new product even though the current product was not fully operational concerned Johnson.

The customer testing the AT&T offering had installed two multiplexers, one for voice and the other for data. Johnson would have liked to see one multiplexer used for both voice and data.

The Amdahl multiplexer was being beta tested in a Toronto network that was already using more than 700 other Amdahl multiplexers. Johnson was impressed that the Multistar III was compatible with previous Amdahl offerings. Amdahl has had great success in Canada and supplied the Canadian phone company with much of its multiplexing equipment.

Almost a year ago, Peabody received three Multistar IIIs and has had virtually no problems with the products. "We tested the product during our lunchtime because we didn't want to bring it up during a busy time of the day," Johnson said. Those concerns were not necessary. Johnson reported that there has been no downtime caused by the Multistar IIIs since they were installed.

The only snafu has been the delay in tying the Kentucky offices into the net. When the plans were initially drawn up, AT&T said that T-1 lines would be available in Henderson by March 1986. At the beginning of this year, AT&T moved that date back to November 1986.

Recently, the date was pushed back until the first quarter of 1988. Instead of linking the offices by AT&T lines, Peabody intends to tie its Kentucky office to the network through two microwave T-1 lines. Microwave dishes will be placed on top of a new office complex upon its completion in the first quarter of next year.

DATA DIALOGUE

PAUL KORZENIOWSKI

Despite itself, DISOSS use spreads

DISOSS is as palatable as castor oil. Neither vendors nor users seem to like the product, but everyone is slowly ingesting it.

DISOSS, an application program that runs under IBM's CICS teleprocessing monitor, supplies electronic mail and library services and enable a number of users to access documents stored on a mainframe.

The software has been available for more than five years and was designated as a strategic IBM product in 1982.Users and vendors see DISOSS as a method for linking electronic mail systems.

Since IBM said DISOSS will play a key role in Big Blue's office automation strategy, companies competing in that market have been adding DISOSS support to their products. Hewlett-Packard Co. recently joined Digital Equipment Corp., Data General Corp., Wang Laboratories, Inc. and Burroughs Corp. as DISOSS disciples.

Users are also supporting the product, and more than 500 DISOSS licenses have been sold.

Despite the groundswell of support, DISOSS has garnered few compliments. Analysts have attacked the product and said it is not user-friendly and requires many mainframe resources.

Another shortcoming is the cumbersome manner in which DISOSS documents are exchanged. Competitors have delivered alternate methods of linking electronic mail systems and some methods are sleeker than DISOSS. For example, Soft-Switch, Inc., a start-up company in King of Prussia, Pa., has been selling its software to Fortune 500 companies, perceived as typical DISOSS customers.

The following example illustrates why some large companies prefer the Soft-Switch product to DISOSS.

On an HP3000 minicomputer, a user may create a document that includes bold underlined text. He can convert that document to a DISOSS format and ship it to a user with an IBM Displaywriter. The Displaywriter may not support bold underlined text. That portion of the text would appear on the Displaywriter but would not be marked to indicate bold underlined format. Soft-Switch's product translates the document so that a user would see that the text originally appeared in bold underlined format.

Because of DISOSS limitations, large corporations are merely experimenting with the product rather than implementing it on a widespread basis. Few companies currently use DISOSS on a wide scale.

Despite the barbs, analysts agree that DISOSS use will increase in a few years. "DISOSS is becoming a checklist item at most large companies," said Lee Doyle, senior analyst at International Data Corp., a Framingham, Mass., market research firm.

One reason for the support is IBM's statements that DISOSS will play a key role in the company's future plans. DISOSS is one of the few programs that support IBM LU 6.2 communications protocol. IBM is expected to enhance DISOSS.

Links to DISOSS by vendors such as HP and DG have only recently become available. Few of the links have actually been sold, and many users are a bit leery of purchasing unproven products. Sales of these products should increase and capabilities should improve after daring users wring out the products.

In the short-term, DISOSS will remain difficult to swallow. In the long-term, the product should become more palatable.

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To keep that information clear and accurate over long distances, you can add echo canceling.

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And to find out more about what our completely compatible new CP2000 digital termination can do, you can write Granger Associates, 3101 Scott Blvd., Santa Clara, CA 95054-3394. Or, call us. Outside California, 1 800 538-8157 ext. 886. Inside California, 1 800 672-3470 ext. 886.

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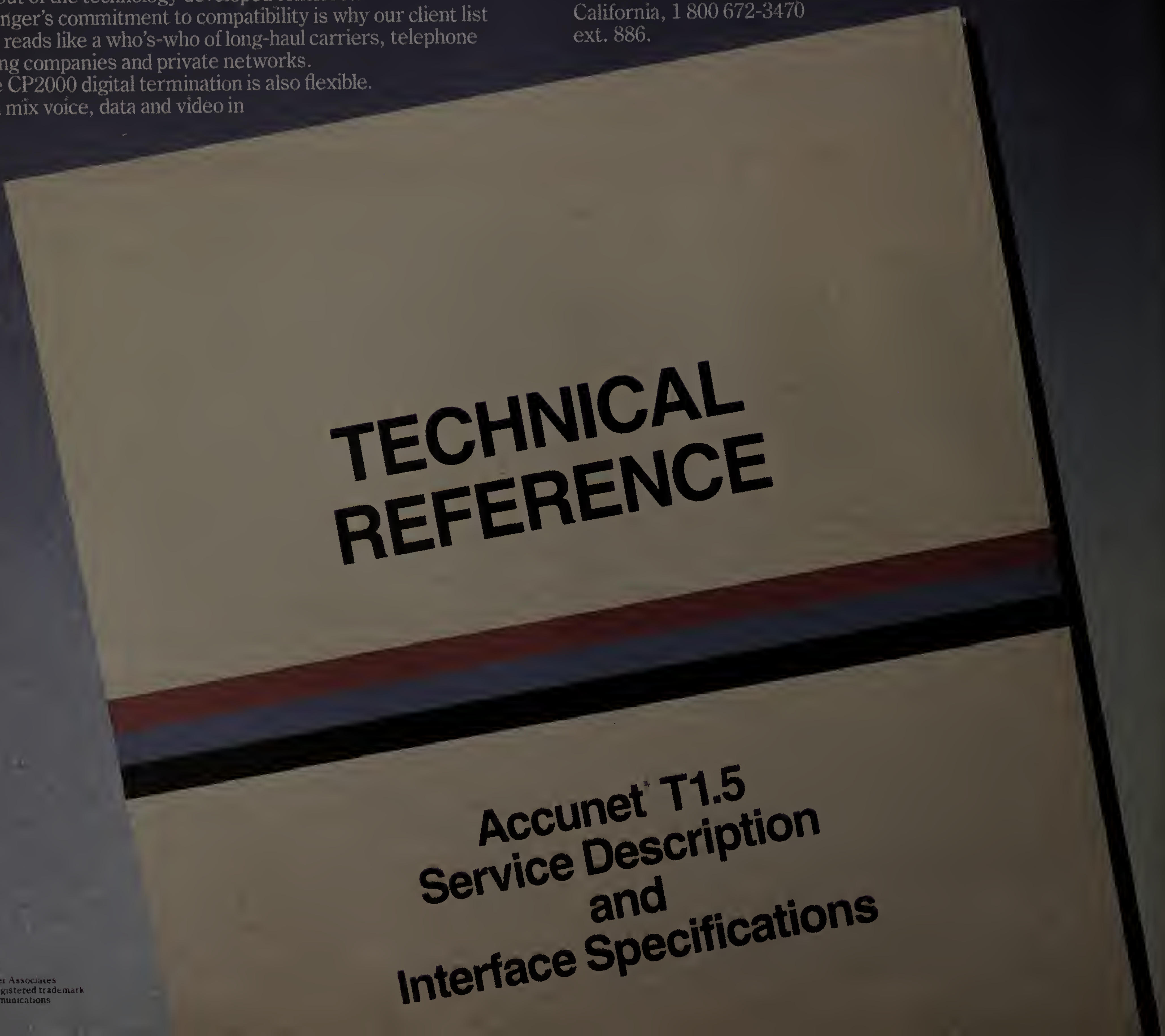

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LOCAL NETWORKING

Dealer certification offered

“3Com Corp. recently announced a new dealer certification program called 3Wizards. To qualify for the 3Wizard program, dealers must complete a 3Com entry examination and 3Com 3+ software support course, as well as have experience installing at least two 3+ local networks. Those accepted will become 3Wizards after successfully completing a three-day 3Wizard Advanced Network Systems Training course.

▶ NETWORK POWERHOUSE

Novell expands hardware line

New 80386-based devices promised.

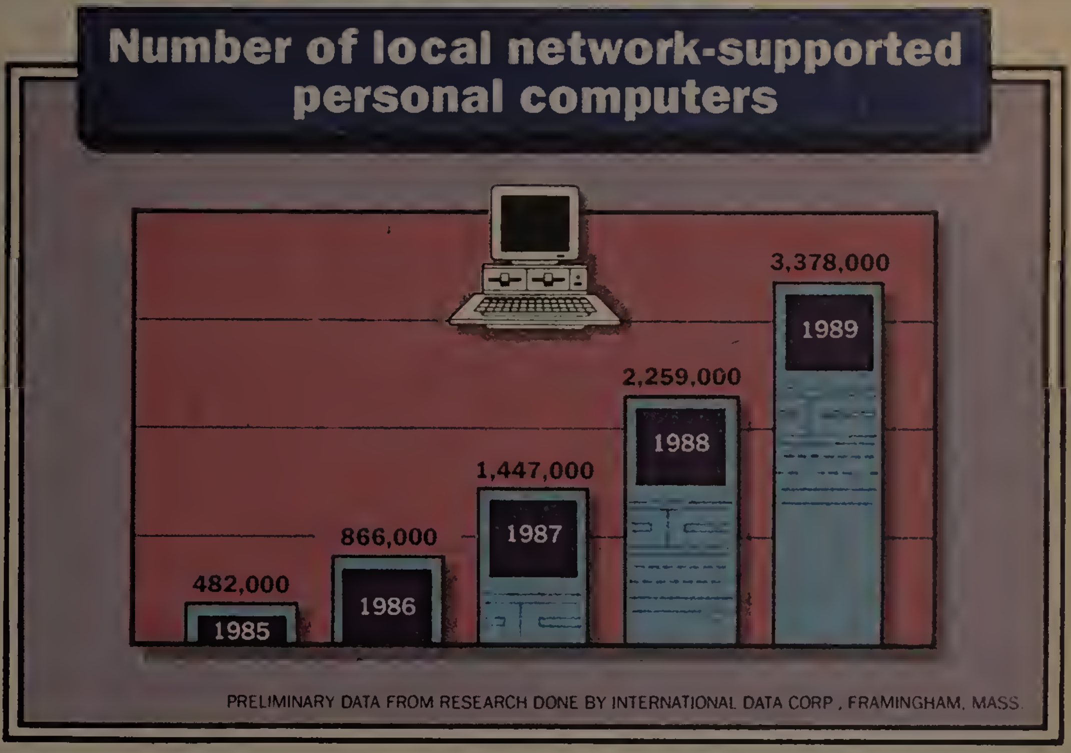
BY PAM POWERS AND JOHN DIX
Network World

OREM, Utah — Local network powerhouse Novell, Inc., known primarily for its network operating systems, added depth to its hardware portfolio with the acquisition of Santa Clara Systems, Inc., two weeks ago, and told analysts in a recent briefing that it intends to release products based on Intel Corp.'s 80386 microprocessor early next year.

The new emphasis on hardware,

See **Novell** page 22

Number of local network-supported personal computers



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LANMARKS
BOB WALLACE

Diskless LAN workstations promise benefits, some losses

Although the low cost of local network diskless workstations will appeal to users, the network application will actually determine the ultimate success of this new type of node.

Diskless personal computers, vendors promise, will lower the cost of network workstations from roughly $2,000 to somewhere between $600 and $800.

The cost reduction is made possible by doing away with the need for each workstation to have a floppy disk drive and a separately procured network interface unit.

To users, diskless workstations will look and act like conventional terminals. Turning the unit on will cause an Initial Program Load from the server, after which the user will be able to access any server-based applications and files.

From management's perspective, diskless workstations promise to reduce network costs and return network control to a central source.

But management appeal alone won't guarantee the success of the new devices.

In many applications, users will be reluctant to give up local storage. The popularity of personal computers is due, in large part, to the fact that users can establish and maintain their own specialized computer world without having to rely on corporate MIS or a shared resource.

While a diskless workstation hooked to a server can mimic a personal computer complete with disk drive, the diskless variety cannot provide the performance of a local hard disk or the ability to do things such as backing up critical or highly confidential files locally.

Additionally, while MIS has traditionally controlled the purchase of terminals, it has not typically been involved with the purchase of personal computers.

Without MIS persuasion, how many users will opt for diskless workstations that would, at least to some degree, give control of their equipment back to a centralized control group?

Finally, the cost of personal computers and network interface cards is constantly eroding, lessening the importance of lower cost diskless workstations.

The diskless workstation is, however, perfect for some applications.

In publishing, for example, there is little or no need for each workstation to have a disk drive. The only application required is word processing, and every user can have a private disk volume on the server.

Besides reducing the initial purchase price, use of diskless workstations would minimize maintenance concerns by limiting the number of moving parts in a given network. Disk drives are one of the largest single sources of hardware failure points in any network.

Diskless workstations will find a home in local networks, but their acceptance may be slower than many expect.

That will change when local networks are installed to fill processing needs, instead of being installed as an afterthought to enable users to communicate or share a common resource.

▶ PYRAMID TECHNOLOGY

Supermini maker to peddle PC links

BY MARY PETROSKY
West Coast Correspondent

MOUNTAIN VIEW, Calif. — Superminicomputer vendor Pyramid Technology Corp. has announced its first local network connections to personal computers, a move analysts believe is a signal that the company hopes to expand beyond the technical marketplace into the commercial market.

The new Pyramid Connection line of products will allow Pyramid's superminicomputers to communicate with IBM Personal Computers and compatibles, Apple Computer, Inc. Macintoshes and Sun Microsystems, Inc. engineering workstations. The Connection products are largely the result of strategic alliances and marketing agreements between Pyramid and Kinetics, Inc. of Walnut Creek, Calif. and Centram Systems West, Inc. of Berkeley, Calif.

Pyramid also has an agreement with Mountain View, Calif.-based Sun to resell PC-NFS, the personal computer version of Sun's Network File System.

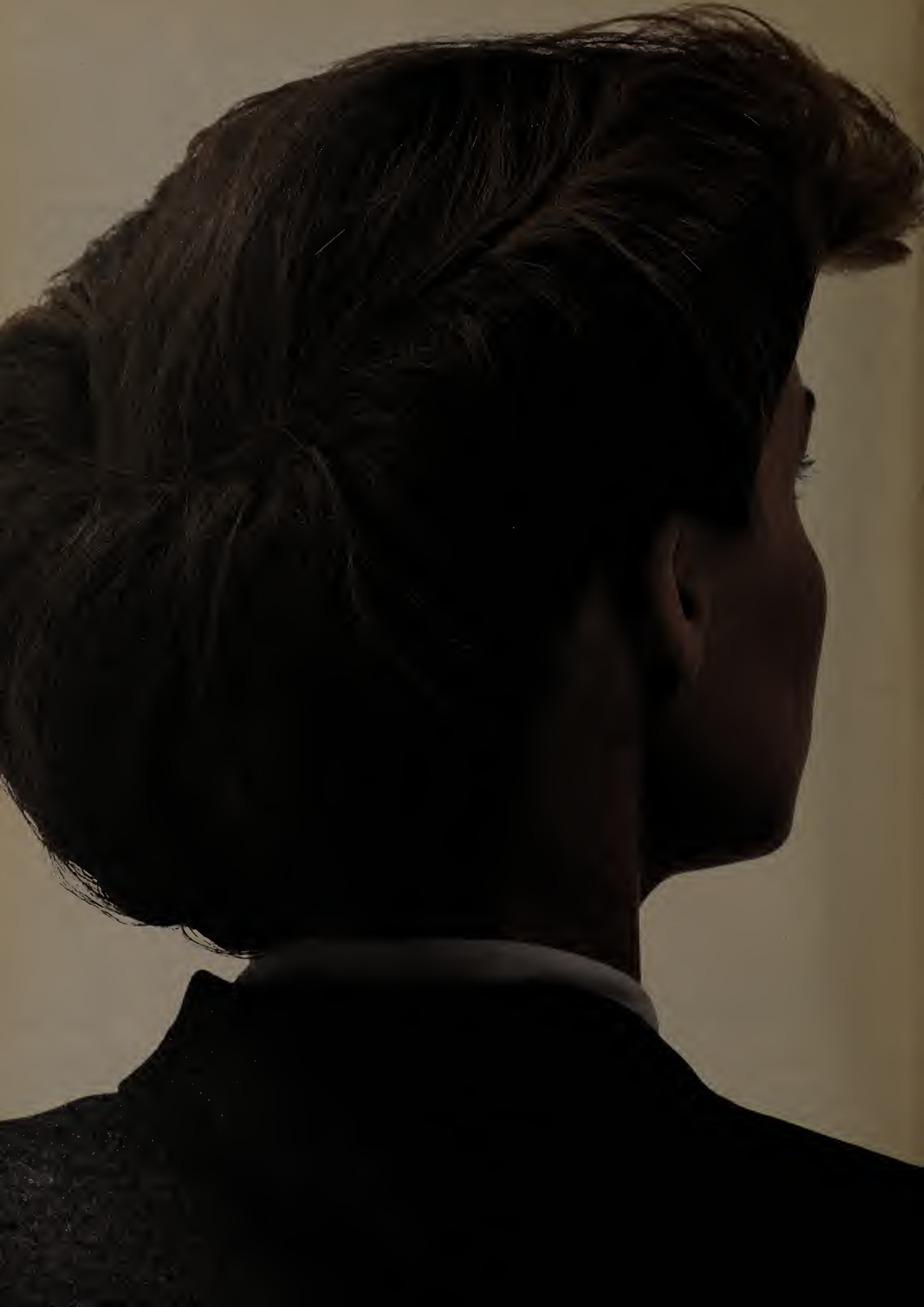
"What you're witnessing is a change in strategy," said David Gewirtz, manager of Pyramid's strategic marketing and business development. By offering network hooks to low-end computers, Pyramid is shifting its focus from so-called early adapters to more mainstream users, he said. Pyramid already offers Ethernet support, high-speed channel connections to larger computers and X.25 connections, Gewirtz said.

Pyramid's decision to link with personal computers could help the company increase sales, according to Kathleen Hurley, a research analyst with Dataquest, Inc. of San Jose, Calif. "They're trying to gain market share by targeting the commercial marketplace. I think it's a pretty wise decision," Hurley said.

To link with the Macintosh world, Pyramid will market the Kinetics FastPath gateway, which connects AppleTalk and Pyramid Ethernet networks. Each gateway, priced at $2,500, can connect up to 31 AppleTalk nodes to the Pyramid network. Pyramid will also be marketing Kinetics K-Term program, which provides multiple Macintosh windows emulating VT-100 terminals and allows Macintosh users to access applications running on the Pyramid host.

Pyramid is providing support for AppleTalk protocols within its operating system, OSx. OSx is a dual port of

See **Pyramid** page 22



In the new world of the IBM Token-Ring network it's nice to see an old familiar face.

The Token-Ring LAN is a reality. It shouldn't surprise you that IBM® was the first company to develop it.

It should be equally unsurprising that the technology that best allows the Token-Ring to communicate with the mainframe comes from DCA, the people who created IRMA.™

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All of that without an IRMA board.

The IRMALAN family includes gateways that connect Token-Ring networks to both DFT controllers and SDLC communication lines too.

Best of all, IRMALAN can do all that with the ease and simplicity of IRMA. Which means your users can feel as comfortable working with IRMALAN as they do with IRMA.

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Pyramid from **page 19**

Unix and implements both Berkeley 4.2BSD and AT&T System V Release 2.2. Pricing for the AppleTalk protocols is from $4,000 to $6,000.

To provide translation between files running on different computer systems, Pyramid will be marketing Centram's Tops networking products. These include a Unix version of Centram's distributed file system developed specifically for Pyramid. Tops for Unix ranges in price from $3,000 to $11,000. It supports transparent file access by Macintosh and IBM Personal Computer-compatible computers to the Unix host over the Ethernet and Appletalk networks.

Pyramid is also reselling Tops for the Macintosh and Tops for IBM PCs. The Macintosh program, priced at $149, gives Macintosh users access to files stored on a Pyramid host. Tops for the Personal Computer, priced at $389 for both software and the AppleTalk interface card, lets users of IBM micros and compatibles access the Pyramid host.

Since Tops is a low-end distributed file system, operating at 250K bit/sec, Pyramid is also offering Sun's PC-NFS for users who want a higher performance file system. In addition to operating at 10M bit/sec, PC-NFS includes VT-100 terminal emulation and a remote print server. It is priced at $395.

PC-NFS is available now; the other products will be available in the first quarter of 1987. ☐

Novell from **page 19**

which includes a diskless workstation announced last week, reflects Novell's attempt to boost its product line to become a full service company, according to Harvey Freeman, vice-president of Architecture Technology Corp., a research firm in Minneapolis.

Novell, one of the largest local net vendors, has stood alone in the network market with its emphasis on software and distribution through OEMs and distributors. Its closest competitor, 3Com Corp., has concentrated primarily on hardware sales. But now, Freeman said, "3Com and Novell are going head-to-head. 3Com has branched more into software, and Novell is moving further into hardware."

Actually, the industry reputation Novell has established by reselling its NetWare operating system to other net vendors belies the success the company has had selling hardware.

According to Freeman, most of Novell's revenues come from the sale of S-Net, the company's own NetWare-based network, communications boards and gateway hardware. "Now with Santa Clara Systems, they will sell diskless personal computers and other devices," he said.

Santa Clara Systems, a maker of personal computers, storage subsystems and net products, has resold Novell's NetWare since 1983. Novell acquired the company to "develop products that will be tightly coupled with Novell's future directions and also to gain a stronger presence in the Bay area," said Craig Burton, vice-president of corporate marketing and development at Novell.

One byproduct of the company cooperation is diskless network workstations. Last September, Novell, Santa Clara Systems and Hyundai Electronics of South Korea announced a joint venture to develop low-cost network stations. Terms of that agreement called for Santa Clara to design a Novell Netware-compatible workstation that would be manufactured by Hyundai in South Korea.

The diskless personal computer will reduce the high cost of connecting workstations to local nets. A Novell spokeswoman said the diskless network workstation would sell for $699. That represents a significant savings when compared to the roughly $2,000 it costs today, an estimation based on the assumption that personal computers cost $1,200 and network interface hardware can cost $700.

Burton said the company will sell the diskless workstation through Santa Clara Systems, now a wholly owned subsidiary, because of small profit margins and heavy competition. Priorities for development and marketing lie in other areas, Burton said.

High on the priority list is development of hardware and software for systems built on Intel's new 80386 microprocessor. This processor is a full 32-bit device, compared to the Intel 80286 used in Novell's present S-Net server, which is 32 bits internally but is restricted by 16-bit wide input/output channels. Besides speed advances, the 80386 will enable the server to support more physical and virtual memory.

Novell told analysts at a Boston briefing it will introduce an 80386-based server and an 80386-based operating system in the next six months, according to Doug Gold, a senior communications analyst with International Data Corp., a research firm in Framingham, Mass.

Although Novell seems to be emphasizing hardware now, the company remembers its roots. Burton credits the company's NetWare operating system with Novell's 140% growth in the last year. The company claims more than 40,000 users, and Gold estimates they have a 21% leading market share. ☐

The ATDM from Astrocom can multiplex data from up to six synchronous devices on to a single DDS 56K transmission link, CCITT equivalent 64K transmission link, or either of these speeds on private 4-wire 56K or 64K bps lines. It divides the bandwidth among its six channels in any combination of speeds from 2.4 to 19.2K bps.

ATDM set up and operation is extremely simple. The unique LCD command display lets you easily set port speeds, monitor system status and perform network diagnostics — no DIP switches to set. Parameters are downline loaded to remote units. Other features include:

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COMMUNICATIONS MANAGER

> “Users always complain that phone systems are too complex. But if manufacturers didn't continue to make systems with multiple features, they fear they would be considered also-rans in the telephone market.
>
> **Craig Eckert**
> Director of marketing/sales support
> NEC America, Inc.

TELEPHONE ILLITERACY

Phones mystify users

Confusion over features/functions wastes time, money.

BY MARGIE SEMILOF
Senior Writer

Back in the good old days, no one ever said, “I'll try to transfer your call, but if I lose you, the extension is . . .”

That's because in the good old days, maybe five to 10 years ago, most people knew how to use their telephones. Now, it's a safe bet that the majority of end users, top executives and perhaps some communications managers have no idea how to use even the simplest of the features on the telephone sets that came with their private branch exchanges.

Despite a variety of training opportunities, the majority of users still bungle basic telephone tasks. Although telephone illiteracy may not seem like a serious problem, it can wind up costing a company millions of dollars in lost business. Potential customers may slam down their own phones after five minutes of being bounced around another company's phone system.

Employees also waste much of their own time leafing through training manuals and wrangling with keypads while customers impatiently wait to be transferred. And users may be squandering the company's costly investment in advanced PBX features.

Telephone illiteracy is typically blamed on a couple of factors: the increasing complexity of telephone sets and the difficulty of pinning down just who should be responsible for end-user training — the communications manager, the telephone systems vendor or end users themselves.

> *“Although telephone illiteracy may not seem like a serious problem, it can cost a company millions.”*

Some managers say that, despite the fact that many companies offer extensive in-house telephone training seminars, the job of teaching end users how to use their telephones is often viewed as a lower priority than other technical and managerial duties.

But many managers place the blame of telephone illiteracy squarely on the end users' shoulders. Although users are provided with a wealth of training materials and classes, they often fail to take the initiative to learn how to use their telephone sets. Users will often skip training sessions and ignore how-to manuals, apparently in the belief that it's easier to live without sophisticated phone features than to knuckle down and learn their ways around the keypad.

John Compitello, telecommunications manager at New York-based Irving Trust Co., said that although his company provides ample telephone training for all employees, the end user has the ultimate responsibility for learning how to use the telephone. Irving Trust holds a 3-hour telephone training course for new employees and provides additional instruction when any changes are made to the system.

“We have an 8-page telephone directory and an 8-page users guide,” Compitello said. “But end users and their department managers must take some initiative. You cannot force people to learn; you can only make training tools available.”

Regardless of who's at fault, some managers are trying to simplify training techniques to combat telephone illiteracy.

Jeff Lipton, telecommunications manager at the University of Colorado in Boulder, argues that a simplified training process is the only

See **Illiteracy** page 24

GUIDELINES

MARGIE SEMILOF

Networks of the future: One for every profession?

It's likely that once people become accustomed to the idea of profession-specific networking, they will view such networks as indispensable tools.

Proof of this is provided by the American Bar Association (ABA), which is helping law firms and corporations with a large staff of in-house attorneys to beef up their legal resources by providing them with a national on-line network.

Like the Institute of Electrical and Electronics Engineers' nationwide net that links engineers involved in standards development, ABAnet is one of the few successful networks that serve a single group of professionals.

About 3,000 attorneys use ABAnet, which has been up and running since February 1984. For a one-time fee of $50 and an hourly rate ranging between $12 and $14, ABAnet users have access to legal document distribution services and electronic mail services between ABA members, in addition to public news services such as airline guides.

The main attraction, however, is the network's variety of specialty legal services. They include a list of expert witness candidates throughout the country and a legal forms data base that provides a collection of text abstracts.

The network's electronic bulletin board operates as a forum for information and questions about equipment and events concerning the legal profession.

Users are able to access the network via personal computers or terminals that hook asynchronously to 300 bit/sec or 1,200 bit/sec dial-up lines, provided by either GTE Telenet Communications Corp., Tymnet/McDonnell Douglas Network Systems, Inc. or Uninet, Inc.

Law societies in England and Canada are also building similar networks. The success of those nets will depend on their societies' ability to introduce and impress the value of communications tools within their professional communities.

PEOPLE

Donald Czubek and **Stephen Randesi** founded Gen2 Ventures, a consulting firm specializing in services dealing with multitechnology networking in large organizations.

Czubek and Randesi previously founded Communications Solutions, Inc., an IBM Systems Network Architecture software supplier.

◆

Henry Nothhaft was appointed president of DSC Communications Corp.'s transmission group, Granger Associates, Inc. He was formerly president of DSC's switching group, Digital Switch Corp.

Nothhaft will replace **Lewis Ellmore**, who has resigned to pursue other business interests but will remain a consultant to DSC.

◆

Thomas Mayer was appointed executive vice-president and general manager of the private branch exchange division at Mitel Corp. Mayer will assume responsibility for PBX operations worldwide.

Mayer was most recently executive vice-president of operations for the PBX division at Mitel.

◆

L.W. Gray was named vice-president of education at IBM. He heads a new consolidated corporate education organization that will support worldwide IBM employee education in areas such as employee management, finance, and technical and information systems.

Gray was most recently president of IBM's Southwest marketing division.

◆

Peter Savage was appointed president of Commterm, Inc. He most recently served as senior vice-president of research and development for the company.

Savage directed the development of Commterm's voice

See **People** page 24

Illiteracy from **page 23**

way users will accept new equipment. "No matter how great the technology," he said, "it won't be used to its full potential unless the human element can interact with it."

The university recently traded in its key phone systems for a 10,000-line PBX and cut over approximately 3,000 end users in six weeks. When faced with the task of training an entire university community, Lipton balked at using vendor-prepared materials. "The explanations were too technical and general," he said.

Instead, he designed his own user manual specifically tailored to the needs of the university users. The communications management team prepared a training strategy prior to the cutover that offered training classes in three languages.

Lipton also introduces new features to the user community by describing one new capability each month via the university newsletter. "You cannot introduce every new feature at once," he said. "Otherwise, end users won't remember how to use the five or six features that they will need every day."

At the First Tennessee Bank N.A. in Memphis, Tenn., new employees must attend mandatory telephone training classes as well as a refresher course 30 days after joining, according to W. Harold Johnson, vice-president of telecommunications and office automation. The classes not only instruct users how to perform basic telephone functions, they also train users in telephone etiquette.

"We can't afford to have people misuse the telephone," Johnson said, "so our telephone training program is a very conscious effort. Our employees can't blindly transfer calls. They must follow every call from Point A to Point B."

Phone illiteracy is more than just a waste of features; it can cost the company in other ways.

Irving Trust's Compitello said improper phone use is often the culprit behind many unnecessary requests for repair. End users complain their phones don't work when the problem often is that they don't know how to perform a certain task.

When a repair request comes in, one of the bank's telecommunications consultants is dispatched to the department to observe how the user operates the phone. "We usually know the end user is doing something wrong based on the type of repair request we receive," he said.

Despite being blamed for fomenting user confusion, manufacturers are loath to dispense with any of the widening array of phone features because they don't want to risk losing out to competitors.

Craig Eckert, director of marketing/sales support at NEC America, Inc., agrees.

"Users always complain that phone systems are too complex," he said. "But if manufacturers didn't continue to make systems with multiple features, they fear they would be considered also-rans in the telephone market."

But manufacturers are trying to make phones easier to use. Ben Yemada, manager of mechanical and industrial design at Rolm Corp., explains that his company tries to manufacture telephones that do one job with a single button, rather than have one button perform a variety of functions.

"That's why there seems to be so many buttons on many phones," he said.

Although most telephone dial pads are alike, Yemada said confusion mounts for end users because the names given to various functions are not always well-defined. "They are often abbreviated on the keypad," he said, "or have dual meanings that are easy to misinterpret."

Yemada said end users never thought twice about using their key systems because it was only a matter of pushing a lighted button.

Now, he claims, different manufacturers place buttons for various phone features in different places. "I still occasionally have to think twice about some of the features I never use," Yemada said. ◘

People from **page 23**

processing systems.

Prior to joining the company, Savage was vice-president of engineering at Infinet, Inc.

* * *

Gary Wetsel was named vice-president of finance at Ungermann-Bass, Inc. He replaces Robert Krause who has left the company.

Wetsel is a former group controller at Rolm Corp. In his new position, he will be responsible for financial planning, accounting, and tax and treasury functions. ◘

Wanted: *If you are a recently promoted communications manager or if a member of your technical staff has changed positions,* Network World *would like to hear from you. Please send name, new title and information describing present and former positions to* Network World, *375 Cochituate Road, Box 9171, Framingham, Mass. 01701.*

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NEW PRODUCTS AND SERVICES

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Comparative review
CCITT V.32 modems:
Can they deliver?

▶ SYSTEMS NETWORK ARCHITECTURE

Codex speeds link

New SNA gateway supports more ports.

BY JIM BROWN
New Products Editor

CANTON, Mass. — Codex Corp. recently increased the communications speed and number of ports of its Systems Network Architecture gateway. The firm's 4255 SNA Gateway connects up to 16 asynchronous or Binary Synchronous Communications (BSC) devices to an IBM SNA host at speeds up to 19.2K bit/sec.

The 4255 replaces the 4250 SNA Gateway, which came in either four-, eight- or 12-port models with a host link speed of 9.6K bit/sec. According to Paul Vitello, product manager for the 4255 SNA Gateway, Codex will manufacture the 4255 SNA Gateway itself. The 4250 had been provided under an OEM agreement.

The 4255 SNA Gateway mimics a 16-port cluster controller and protocol converter, which converts asynchronous and BSC protocols for transmission over a Synchronous Data Link Control link to an IBM SNA host. An asynchronous model supports eight ports, expandable to 16 ports in two-port increments. A full-function version supports conversion of both asynchronous and BSC protocols and is available with between two and 16 ports.

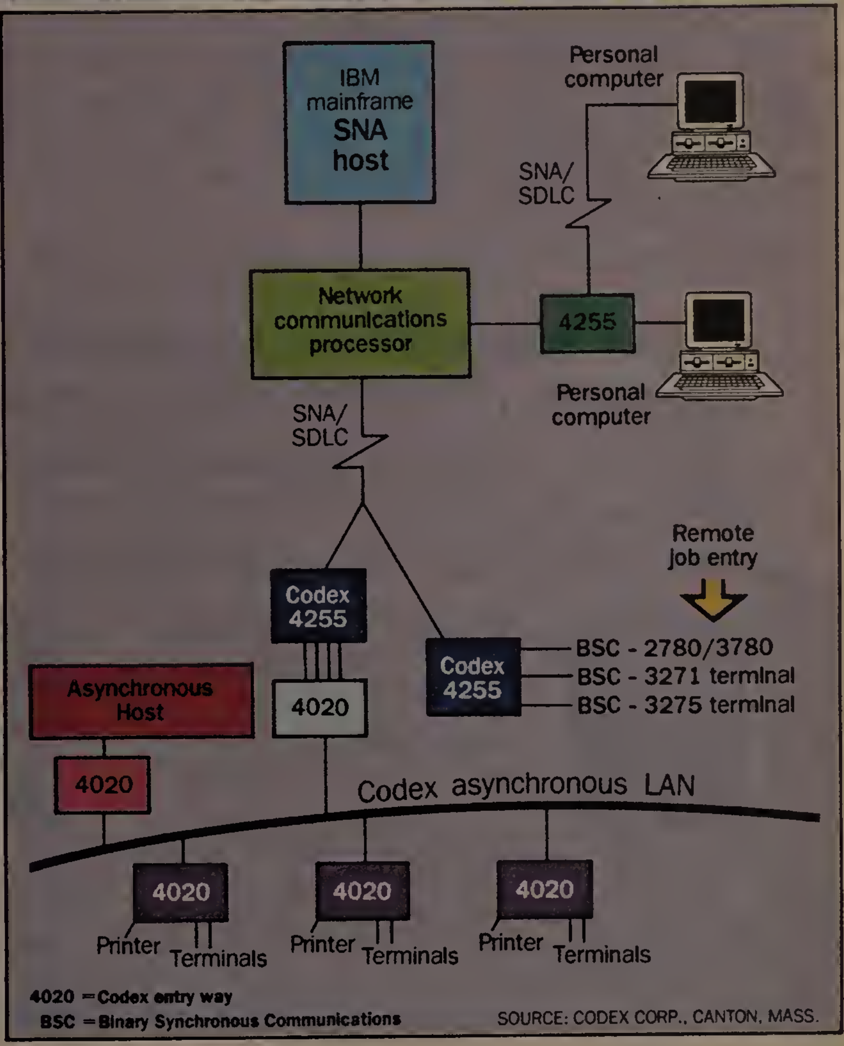
The 4255 SNA Gateway supports personal computers, minicomputers and other devices using asynchronous protocols as well as BSC protocols used in IBM 3271 communications controllers, IBM 2780 and 3780 batch remote job entry terminals and IBM 3275 terminals.

Devices connect to the 4255 at speeds of up to 9.6K bit/sec. The 4255 connects to the host over direct links, or dial-up or private leased lines.

The 4255 SNA Gateway is software controlled, allowing a host site administrator to add or delete devices from the unit and to download any SNA enhancements to the gateway.

A 16-port asynchronous version will list for $7,800 while a four-port full-function asynchronous and BSC version will cost $7,300.

The Codex 4255 SNA gateway



4020 = Codex entry way
BSC = Binary Synchronous Communications

SOURCE: CODEX CORP., CANTON, MASS.

▶ COMDEX/FALL '86

Convergent uncloaks LAN plan, diskless PC

BY JIM BROWN
New Products Editor

LAS VEGAS, Nev. — Convergent Technologies, Inc. introduced a slew of products at Comdex/Fall '86 here last week, including a twisted-pair wired local network.

The San Jose, Calif.-based firm also unwrapped its Network PC, a diskless IBM Personal Computer AT model clone, and a board supporting personal computer access to its ClusterNet local net. Lastly, the firm added VM capability to its Ngen workstation's CTOS operating system.

Convergent's ClusterNet networking scheme uses a ClusterShare package running on a Master Ngen workstation and ClusterCards inserted in other Ngen workstations or Personal Computers. ClusterCards provide the RS-422 connector to link the devices while ClusterShare converts all MS-DOS requests to CTOS.

The RS-422 ClusterNet wiring can be replaced with telephone wiring by using the firm's TeleCluster hardware. Developed under a technology share agreement with David Systems, Inc., TeleCluster works with analog private branch exchange or Centrex systems and operates at 307K bit/sec or 1.84M bit/sec. It links up to 24 devices in a star configuration.

Workstations and telephones connect to a TeleCluster Adapter box which sends voice and encoded data over voice signals to a TeleCluster Hub near the private branch exchange or telephone punch down block some 1,200 feet distant. The Hub passes voice to the voice switch and forwards the data to another adaptor located within 1,200 feet.

"We think the TeleCluster is the vehicle that will allow us to really become exceptionally known in the communications and local-area network areas," said Jeff Tisza, product marketing manager for Ngen and CTOS.

The firm's diskless IBM Personal Computer AT clone is called the Network PC. Expected to cost under $2,000, it has an Intel 80286 microprocessor with 1M byte of random access memory, an EGA graphics board, a floppy disk controller, a serial port and a parallel port. A ClusterCard will fit in one of three expansion slots.

The new CTOS/VM operating system allows Intel 80386-equipped Ngen workstations to support numerous virtual Intel 8086 operating modes in its memory, in effect making the Intel 80386 microprocessor look like a number of 8086-based personal computers running MS-DOS. CTOS/VM will also run AT&T's Unix System 5.3 operating system currently with MS-DOS, allowing existing MS-DOS and Unix application programs to run simultaneously. "That's something that has always been a strong selling point for us. You've always been able to hold on to what you have," said Tisza.

The Intel 80386 also allows an Ngen workstation that has been defined as a network server, or Master workstation, to support up to 20 other devices located within 1,200 feet. The Master Ngen workstation can emulate an IBM 3274 communications controller allowing connected devices running emulation programs to access IBM's System Network Architecture, X.25 packet switching or Binary Synchronous Communications nets.

Products & Services

10-Net Version 3.1

Fox Research, Inc. released a new version of its 10-Net local-area networking system that takes advantage of MS-DOS Version 3.1 and above.

The 10-Net Version 3.1 reportedly allows the twisted-pair wired local net to support multiuser application software and provides menu-driven expanded security features, such as directory security, group security and unique file ownership.

The new release offers enhanced printer spooling, which allows users to prioritize which device takes top billing in the print queue and supports automatic print spooler initiation and termination.

The package also includes dynamic drive sharing, which allows users to begin or end sharing local devices on the network without rebooting their system.

A 10-Net 3.1 kit containing interface card, software, tap box, cable and operator manual is priced at $695.

Fox Research, Inc., 7016 Corporate Way, Dayton, Ohio 45459 (513) 433-2238.

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T-1 Open Systems Integration (OSI)—A Technical and Strategic Review

Leader: Harold C. Folts,
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T-2 ISDN—Status and Developments

Leaders: James G. Herman, Director, and Mary A. Johnston, Senior Consultant, Telecommunications Consulting Group, BBN Communications

In this tutorial you'll learn what ISDN will and won't deliver in the late 1980s, what the emerging ISDN standards will mean in terms of new services and improved network performance, what holes still exist in the standards and trials, how to make smart buying decisions while keeping open your options for ISDN compatibility, and more. *Level:* Intermediate.

T-3 Strategic Planning for Corporate Information Networks

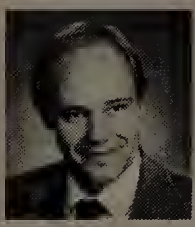
Leader: Dr. Howard Frank,
Howard Frank Associates

Attend this tutorial to learn how to relate vendor offerings and technological trends to your organization's needs and requirements, and to develop a framework to plan future services and systems. You'll examine current issues in network integration, why communication departments must function as "mini telcos," and the pros and cons of software defined networks and private dedicated networks. *Level:* Introductory – Intermediate.

T-4 Planning and Designing Networks with the New Technology

Leader: Dr. John M. McQuillan,
President, McQuillan Consulting

In this intensive seminar, you'll get acquainted with the key architectural principles used by today's leading network planners. You'll review emerging technologies such as T-1 networks, hybrids, VSATs, gateways between SNA, LANs and X.25, micro-mainframe links, and intercompany networks. You'll learn how to plan a corporate network using advanced technologies. *Level:* Advanced.



T-5 Building the Network Management and Technical Control Facility

Leader: Gabriel Kasperek,
President, Kazcom Inc.

This one-day course will help you understand the strategic value of network control, explore alternative technologies for managing your network, and discover how to evaluate current technologies for use in your own organization. You'll become familiar with the test equipment you need for successful network control, and understand industry trends and future directions. *Level:* Introductory – Intermediate.

T-6 Designing Voice and Data Networks Under the New Tariffs

Leader: Robert L. Ellis,
President, The ARIES Group Inc.

Take this tutorial to learn the structure of the post-divestiture tariffs, the latest January 1987 changes to these tariffs, how to price interstate private lines, how to configure and price interstate FX services, the new economics involved in configuring data networks, the LATA-pure strategy, and more. *Level:* Intermediate.

T-7 Managing the Telecommunications Resource

Leader: Gerald P. Ryan,
President and Founder,
Connections Telecommunications Inc.

This one-day course briefs you on how to develop a successful management environment. You'll learn what tools are available to do your job more professionally, how to plan a network management center, how to staff and train the department, and how to prepare and substantiate departmental budgets. *Level:* Intermediate.

T-8 IBM Token-Ring Versus Other LAN Choices

Leader: Dr. Kenneth J. Thurber,
President, Architecture Technology Inc.

This tutorial gives you an across-the-board overview of announced products, future plans, compatible products, and IBM's overall strategy with respect to Token-Ring technology. You'll discuss the Token-Ring's relationship to IEEE 802.5, the IBM cabling systems and hosts, get an in-depth look at NETBIOS and APPC/LU 6.2 interfaces, and more. *Level:* Intermediate.

T-9 VSAT Technology and Implementation

Leader: Dr. Jerome G. Lucas,
President, TeleStrategies

Learn the basics of applying very small aperture terminal (VSAT) satellite communications to your networking needs. You'll get acquainted with basic application requirements in SNA networking, data broadcasting, PC networking, video broadcasting, and teleconferencing. *Level:* Intermediate.

T-10 IBM's Systems Network Architecture (SNA): A Detailed Road Map

Leader: Daniel Zatyko,
President, Zatyko Associates

Enroll in this intensive one-day tutorial to understand the evolution of SNA, and learn fundamental SNA concepts—the seven SNA architectural layers, SNA's physical and logical addressing, strategic SNA products, components of NetView, Token-Ring networks, functionality and capabilities of the LU 6.2/APPC and NETBIOS interfaces, and more. *Level:* Intermediate.

T-11 An Introduction to Data Communications Today

Leader: Gary Audin,
President, Delphi Inc.

This course introduces you to the basic concepts, terminology and technology of data communications. You'll learn how various networks operate and how to select them; how best to interconnect computers, terminals, and PCs using different protocols; and what software is necessary to support protocols and network management. *Level:* Introductory.

T-12 Understanding the Communications Regulatory Environment

Leader: Richard E. Wiley,
Senior Partner,
Wiley, Rein & Fielding

Enroll in this tutorial to learn how telecommunications policy is made and changed, what agencies are active in policy making, how industry segments are affected by current policies, what key issues are now under consideration, and how you can influence future decisions. *Level:* Introductory.

For immediate information or to register by phone call **1-800-225-4698**

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Thurs.: "Basics of Voice Communications" or "Basics of IBM's LAN Choices"

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COMPUTERS OF THE FUTURE

BY JEFFREY ROTHFEDER

Networked number crunching

At first blush, the computer of the future looks more like the computer of the past. Designed and built in Thinking Machines Corp.'s redbrick converted factory on the banks of the Charles River in Cambridge, Mass., this five-foot tall, awkward-looking black box called the Connection Machine seems too large for the "small is beautiful" philosophy that pervades high technology these days.

But there's much more to the Connection Machine than meets the eye. As the product of a three-year research and development effort that cost $4.5 million, the Connection Machine is the fastest and, arguably, the smartest computer to date. The key to its impressive capabilities lies deep in its architecture.

In most computers, there is a two-part design in which many chips contain memory and a few others perform computations on data retrieved piece by piece from memory. The Connection Machine, however, is made up of 64,000 separate, full-fledged but tiny computers, each capable of processing information locally. Allied with each memory storage cell is a processing cell that can manipulate information at the same site.

All of these 64,000 computers, which hold about 4K bits of information each, are linked together in a dexterous communications network that allows them to group and regroup, depending on the problem the Connection Machine is tackling.

The result is known as "massive parallel processing." It is the first implementation of a computer architecture in which a computer breaks apart a puzzle into extremely small pieces and then proceeds to solve the puzzle's thousands or even millions of elements simultaneously.

Massive parallel processing as it occurs in the Connection Machine requires as advanced a communications network as any that exists today. The computer analyzes problems placed before it and creates specific communications channels to support its problem-solving efforts.

The program calls for each memory cell that contains two numbers to add those numbers together and pass the sum to a neighboring cell through the communications network. This single statement, known as a pointer, results in tens of thousands of local additions and then thousands more as hundreds of previously untrod communications lines between processors open at once.

For example, suppose certain memory cells are named Red, Apple, Yellow and Lemon. If pointers in the program call for the property of fruit known as "Color" to be activated, Red and Apple would be automatically connected, as would Yellow and Lemon. This is because as each piece of data is entered into the computer, it is programmed with properties and relationships. All future processing units would use this new way to link data as its foundation.

"In the Connection Machine, the topology of the hardware — how the processors relate to each other — depends entirely from one moment to the next on the information stored in the processors and the dictates of the software," says Danny Hillis, the inventor of the Connection Machine and a founder of Thinking Machines. "Essentially, the Connection Machine constantly reconfigures itself."

Interestingly, this property of the Connection Machine sounds like the answer to the prayers of many a communications manager. Imagine, for instance, distributed computing over a network managed by something as sophisticated as the Connection Machine. Adroitly, literally second by second, the Connection Machine would reorganize the use of computer memory, central processors, peripherals and communications devices on the network to fit the particular applications of numerous users simultaneously.

"There are three main uses for computers that process in parallel," says Ted Sabaty, one of the designers and builders of Non-Von, a Columbia University parallel processing computer similar to the Connection Machine. "They can crunch data faster than any computers we've ever seen, so they're excellent for data base management and high-level graphics applications.

"They're equally well-suited for difficult artificial intelligence tasks like computer vision, and they're perfect for communications applications," Sabaty says. "Good communications management requires open, flexible and adaptable interconnections between the workstations on a network. A parallel processing computer, because it understands this type of network

See **Connection** page 45

Rothfeder is a free-lance writer based in Wyckoff, N.J.

REGULATION

ALAN PEARCE

Prudent jurisprudence?

Lawyers have access to or possess great power at all levels of society. As a result, lawyers have become America's ruling class — an elite in a country that professes to shun elitism.

Washington, D.C.'s population includes at least 40,000 lawyers, according to American Bar Association estimates. This is more than any other city in the world except New York, and twice as many as in all of Great Britain.

Lawyers hold most of the top jobs in the nation's capital. In addition, the majority of our elected representatives in the U.S. Congress are lawyers, as are most of the federal agency heads, including Federal Communications Commission Chairman Mark Fowler. Two of Fowler's fellow commissioners, Dennis Patrick and Patricia Diaz Dennis, are also lawyers. Most senior FCC staff members are lawyers too.

As if that were not enough, the U.S. Congress is populated by politicians who are predominantly lawyers — about two thirds of them at last count. In addition, Congress is staffed at its highest levels with more lawyers.

The Federal Communications Bar Association, based in Washington, D.C., boasts more than 1,500 members. There are more than 75 communications law firms in Washington, D.C. alone, and many of them have clients who must be represented before the FCC, Congress and the antitrust division of the U.S. Department of Justice.

The amounts that these law firms bill their clients is kept confidential. However, a Communications Satellite Corp. (Comsat) shareholder who asked a question about legal fees at a recent shareholders' meeting was told that a law firm representing the satellite company on just one regulatory issue had been paid $650,000 in a single year.

This is probably peanuts to some lawyers when compared with one of the television networks, which allegedly pays its law firm more than $2 million per year to represent its owned and operated TV stations before the FCC.

Antitrust actions in the telecommunications industry also run into millions of dollars in legal fees every year.

When the Justice Department's IBM and AT&T antitrust actions were settled in early 1982, it was reported in the telecommunications trade press that the Justice Department was spending approximately $2 million per year on each of the cases.

On the other hand, the law firms representing AT&T and IBM were reportedly charging their clients between $35 million and $50 million per year just to fight the government's antitrust actions. And legal battles to waive Bell operating company business restrictions make these exorbitant fees appear insignificant.

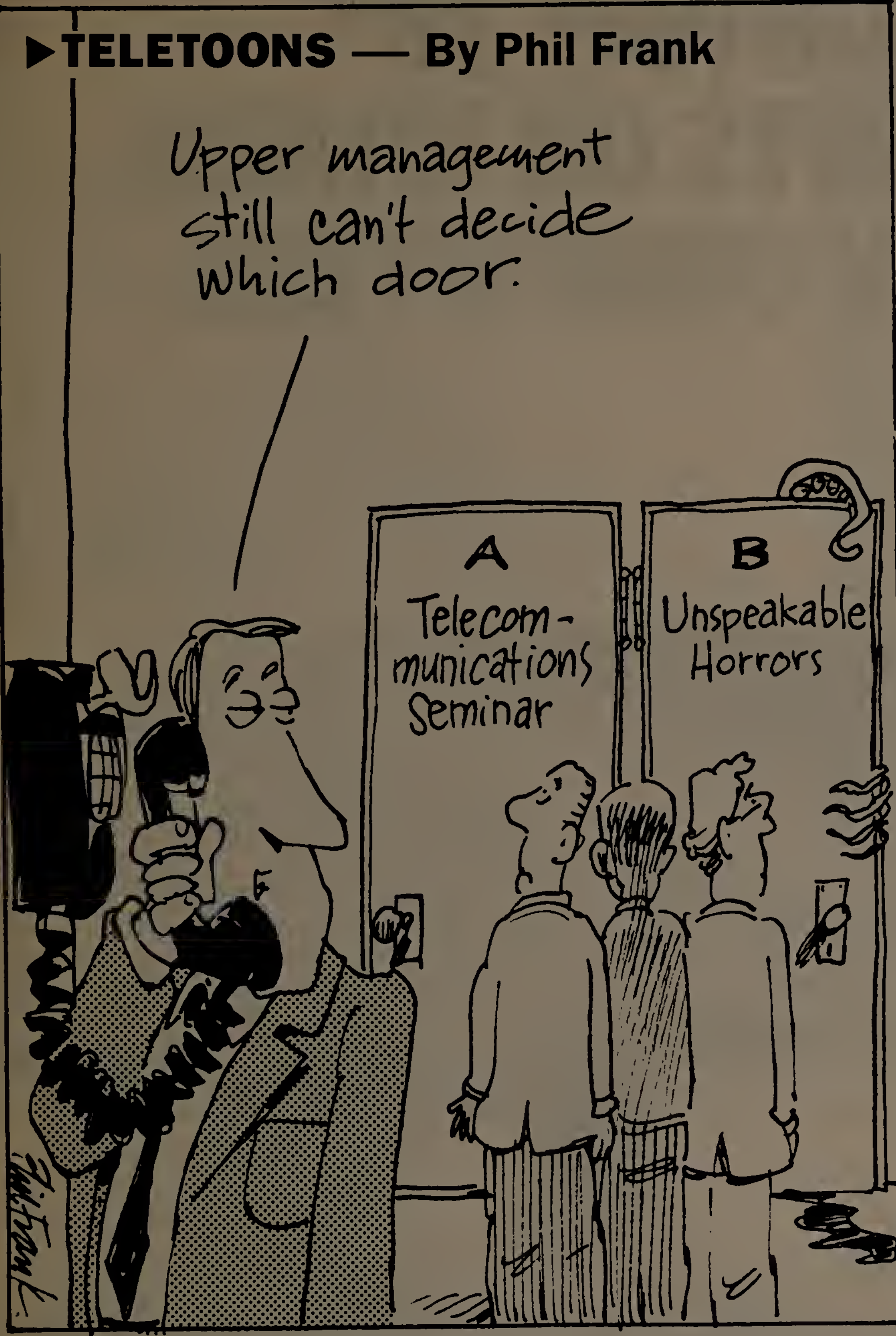
The communications lawyers who represent telecommunications companies and users before the regulatory, judicial and legislative bodies in Washington, D.C. are ambivalent toward the so-called deregulatory trend gripping many of President Reagan's appointees, including FCC's Fowler. If deregulation runs its course, it would jeopardize these lawyers' livelihoods.

Pearce is president of Information Age Economics in Washington, D.C.

Is there a trend out there that no one is picking up on? Write a column about it for *Network World*. Manuscripts must be letter-quality, double-spaced and approximately 800 words in length.

Disk and modem submissions are preferred. Columns should be timely, controversial, literate and technically accurate. Contact Steve Moore, features editor, *Network World*, Box 9171, 375 Cochituate Road, Framingham, Mass. 01701, or call (617) 879-0700, ext. 584.

▶TELETOONS — By Phil Frank


Upper management still can't decide which door.
A
Telecommunications Seminar
B
Unspeakable Horrors
Phil Frank

But perhaps they're not worried, because they can point to the perverse irony that Reagan, who actually came to power with an agenda of deregulation, is being frustrated by some of his own cost-cutting measures.

The president has trimmed the budget so much that some of his political appointees have left government service, largely because of the pay ceiling. As a result, much of the power in government has been left to permanent bureaucrats, who generally favor regulation and have absolutely no intention of deregulating themselves out of work.

Within the regulatory power structure in Washington, D.C., antitrust actions as well as legislative and regulatory decisions concerning the telecommunications and information industries can be decided at the whim of a single lawyer or group of lawyers without regard for the democratic process.

The antitrust action against AT&T was filed in the fall of 1974 by a small group of permanent bureaucrats within the Justice Department, and that action was "successfully" concluded, despite the opposition of the vast majority of elected officials and even President Reagan himself.

Once Congress passes a law, such as an amendment to the Communications Act of 1934, authority to enforce it is given to an agency peopled with lawyers, such as the FCC. Members of Congress rely heavily on senior regulatory agency bureaucrats and political appointees to interpret and even expand upon laws that Congress passes.

These senior bureaucrats, over the long haul, have more clout than the political appointees who head the agency, largely because many of them are lifelong civil servants who may serve under — and influence the policies of — several agency heads.

In the session of Congress that just ended, there were many bills introduced that would further deregulate the telecommunications and information industries and relieve the BOCs of the line-of-business restrictions imposed upon them in the Modified Final Judgment.

Unfortunately, many people in the industry are beginning to act as though these bills are already the

See **Regulation** page 45

MANAGEMENT

BY HECTOR O. MYERSTON

No way to hire a manager

Help wanted: Director of administration. Must have recent Lotus 1-2-3 spreadsheet experience and be Pitney-Bowes Postage Meter qualified. Familiar with Canon 2000 copiers, Eagle pencils and Scripto pens. Recent experience with Stell Case filing cabinets essential.

Ridiculous. No one in his right mind would advertise those qualifications for that job. You want a manager, not a clerk. The job description is way out of line.

However, there are similar ads for telecommunications analysts, managers and directors in almost every trade publication. Management positions are described in terms of exquisite details of specific hardware, software and even vendors. Phrases such as "Rolm-qualified," "Centrex experience" and "XYZ Accounting System Call Version 2" abound. Are the people who write these ads looking for analysts and managers or technicians and clerks?

Let's take the central piece of gear involved in communications, the switch or switches. Does the manager personally maintain the system? Is it cost-effective to pay a senior analyst to do data entry? Or is it the job of management to control and effectively supervise the performance of this function by properly selected and trained subordinates?

Another example: What does a manager have to know about call accounting? At last count, there were more than 80 call accounting packages on the market. They range in price from $495 for stand-alone personal computer packages to $50,000 or more for mainframe-based systems.

Would the people placing the ads rather hire a person who has three years' experience with the XYZ system or someone who knows the functions of various systems and can save the company considerable money by choosing the best one?

Similarly, managers in traffic engineering and routing select the most economical mix of trunking facilities and carriers to complete calls while maintaining high quality.

Again, the task of entering the data in the private branch exchange translation tables is trivial. A manager should supervise the correct entry and maintenance of the data, but he does not necessarily have to be "certified" to do it himself.

In addition, being certified often means having attended a training course and having received a certificate of completion. Which course? It makes no difference. How well did you do? It doesn't say. Certified to do what? It's not defined. In other words, the certification is of limited use in evaluating the specific knowledge or skills of technicians. It is next to useless as an indicator of management prowess.

Another indicator of the quality of telecommunications managers who are sought by the advertisers appears to be "acronym IQ." Anyone knowledgeable in the industry is appalled by the prevalence of nonstandard, ambiguous and totally obsolete acronyms used by their MIS cousins. But at least the MIS side fragments its dialects along equipment lines, such as IBM's SNA. In telecommunications, there seems to be an indiscriminate mix and match of acronyms such as OCC (for other common carriers).

Are these ads written by knowledgeable people seeking qualified applicants? Or are they put together from an equipment inventory or from the previous job description? Does ignorance, caution or fear of an avalanche of applicants guide the ad writing process?

Does it all end well with the right people getting the right jobs? Or are employers doing themselves a disservice with this shortsighted behavior?

In telecommunications management, leadership, technical expertise, and supervisory and communications skills are paramount. Must the search for telecommunications professionals be limited to those working in a mirror-image environment?

The ability to convey ideas to others through the spoken or written word is largely independent of what software the System/85 is running on.

Similarly, management and supervisory skills can be developed independently, whether one is managing an Intem IBX or a loading dock.

Myerston is supervisor of telecommunications analysis for SRI International in Menlo Park, Calif.

ON AT&T'S "HIGHWAY 3B" THERE ARE NO LIMITS ON WHERE YOU CAN GO WITH COMPUTERS.

Like it or not, the multi-system environment is here to stay. Mainframes will be mainframes. PCs will continue to proliferate like mosquitoes. And user needs will change every day.

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Our 3B computer family is among the first to blend the technologies of data processing and communications. Result: a unique ability to distribute processing power across system lines, from user to user, desktop to department, and department to mainframe.

AT&T's 3Bs are easily linked *up* to IBM* mainframes and *down* to any combination of terminals, peripherals, and MS-DOS** PCs. The idea is to open communication between

COMPUTERS WITH THE FUTURE BUILT IN

3B2/310. Supports up to 14 users, 18 RS232C ports. Speed: 1.1 MIPS, 32 bits at a time. *All* 3Bs are 32-bit machines. Storage: 86MB internal hard disk; up to 516MB with Expansion Modules.

3B2/400. Supports 10 to 25 users, 46 RS232C ports. Speed: 1.1 MIPS. Storage: 172MB internal, to 860MB with Expansion Modules.

3B2 XM. Expansion Module adds 23MB cartridge tape storage and/or 30 to 72MB hard disk storage.

3B15. Serves 16 to 60 users, 128 RS232C ports. Speed: 1.6 MIPS. Supports 8 drives, with maximum storage of 2.7 *giga*bytes.

Not shown: Other members of AT&T's 3B computer family serve up to 100 users, across a wide range of business needs and environmental conditions.

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systems—without forcing users to give up the applications they know and trust.

In most offices, the effect on productivity is electric.

"THESE GUYS THINK OF EVERYTHING."

The 3B's role in a distributed data processing environment can grow and change as your business evolves. For starters, UNIX™ System V permits the same software to run on a variety of machines, protecting your investment in applications and user training.

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AT&T's 3B family was created *as a family* to enhance the systems you have today, without imposing limits on where you can go tomorrow.

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To learn how much we can do for your company today, and how far we can take you tomorrow, please contact your AT&T Account Executive, authorized supplier, or telephone 1 800 247-1212.

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NETWORK WORLD

Features

November 17, 1986

Making the terminal connection work
A communications processor means different things to different users. Is it a front-end processor, a network processor or a packet assembler/disassembler? Depending on its chosen function, it can be all three and more. Users must decide what they want from a processor and where to draw the line between functionality and overkill.
Page one.

The bug stops here (Part II)
As with voice networks, a broad view is better when considering your information needs for data transmission facility management. Without the right tools, your network may be an underachiever. A good system will quickly pay for itself in labor and line charge savings while ensuring a more reliable network.
Page 47.

Communicate your special knowledge to other users. *Network World* is soliciting feature articles on bypass, departmental networking and fiber optics.

Send proposals for user-oriented articles on these and other timely communications topics to Steve Moore, features editor, *Network World*, Box 9171, 375 Cochituate Road, Framingham, Mass. 01701, or call (617) 879-0700 ext. 584.

FEATURE FOCUS

Making the term

Continued from page 1

sequencing messages either for transmitting or queuing to network services, pacing the flow of messages throughout the network, performing error correction and protocol conversion, selecting a transmission route and gathering performance and traffic statistics.

Hunter is president of TMS Corp., a marketing management consulting firm in Devon, Pa.

Other people, especially those selling less powerful products, claim anything that can connect a terminal device to a communications network and control the attached devices in response to changing network conditions qualifies as a communications processor. Thus, products being touted as communications processors can be little more than PADs or multiplexers.

The network designer's definition of a communications processor is by far the most reliable because it's from the point of view of someone who implements rather than sells. That definition states that there are two devices that qualify as communications processors: the front-end processor and the network processor. Because the latter has many of the same func-

nal connection

tions as a front-end processor, its use — and its designation — often depend on its placement in the network.

The front-end processor connects directly with the host processor's byte/block multiplexer or selector channels and provides the link between the terminal devices and the host itself.

In performing its duties, the front-end processor carries on a running dialogue with the host and attached terminals to control the movement of data.

The network processor, also called a network concentrator or network node, is a stand-alone unit with a high degree of operating autonomy. Its function is to furnish a link between user terminal devices and the front-end processor and other network processors.

Although the network processor must respond to host and front-end processor control signals regarding the network, it is not host-dependent like a front-end processor.

Another device often found in networks is the remote concentrator. That unit usually resides at a location remote from the host processor and connects with the front-end processor through communications lines.

The remote concentrator provides the link between the terminal devices and the front-end processor or network processor. Generally, it attaches directly to its terminal devices — although most accept remote units that dial into it. Because remote concentrators must respond to directions from the host's front-end processor, the remote cluster is host-dependent.

> Front-end processors are used as network processors or remote concentrators, and network processors are substituted for remote concentrators.

Remote concentrators are not communications processors in the strictest sense because most are single link point-to-point units. The IBM 3270 is the most common remote concentrator.

Although the use of communications processors seems simple enough, the confusion begins in their application. Front-end processors are used as network processors or remote concentrators, and network processors are substituted for remote concentrators.

The root of the protean functionality of these products lies in their architecture, which allows control logic and I/O ports to be switched in and out as the applications dictate. In addition, the ability to program these units allows operators

☞ See **Processors** page 34

Processors from **page 33**

to change functions in the field.

Front-end processors

A front-end processor off-loads those functions from the host mainframe associated with communications. These functions include communications link establishment, message framing and deframing, protocol conversion, message sequencing, error correction, route selection, session establishment and termination.

Some front-end processors also perform packet assembly and disassembly to service packetized networks such as X.25. A few offer interfaces to Ethernet IEEE 802.3 local-area networks.

As part of the management function, most front-end processors will gather network performance and traffic statistics, and log transmission errors and line failures. The front-end processor is a computer in itself. It contains a CPU and memory, controlling software, host interface channel adapters, communications scanners and line interface modules.

The CPU performs tasks such as device addressing, route selection, protocol conversion and error correction. It also directs the operation of all other components in the front-end processor.

> *“Most front-end processors will gather network performance and traffic statistics, and log transmission errors and line failures.”*

The host interface channel adapters convert the serial output from the CPU into parallel form and transmit it to the host's byte/block multiplexer or selector channels. Many front-end processors have a number of host-port interfaces that can be used to send data to different channels on the same host or to a different host entirely.

Most front-end processors use a hierarchical architecture based on a parallel bus. The CPU, for example, is in a separate module while communications and host-mainframe interface modules are contained in their own independent modules.

This modular approach makes adding and deleting components as simple as plugging in or unplugging the affected units. It also safeguards the user's investment because system upgrades involve only swapping new components as opposed to swapping the entire front-end processor. Line interface modules, or line sets, handle the link between user terminal devices and the front-end processor.

Because each line set connects many communications lines, the configurable number determines the number of communications lines that the front-end processor accommodates.

> *“The modular approach makes adding and deleting components as simple as plugging in or unplugging the affected units.”*

Typical line sets handle from two to 32 lines. The line sets usually connect a specific interface type, such as RS-232C, operating at the same data rate, such as 9.6K bit/sec. They permit half-duplex and full-duplex operation.

With some line sets, the total number of lines serviced is halved when operation shifts from half-duplex to full-duplex. Others are unaffected. The front-end processor works in conjunction with communications access software resident either in the front end or the host mainframe.

This software handles functions such as formatting the data to conform to the constraints of the application, sending/receiving messages to terminal devices and controlling interaction between the application and the front-end processor.

Another product that attaches to the host processor channels but does not perform front-end processor functions is the host channel

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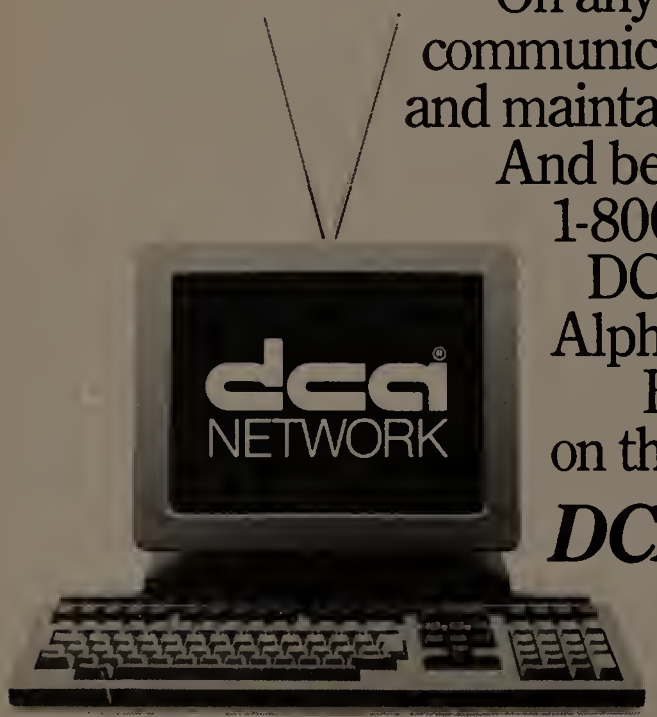

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expander. This unit allows users to establish remote clusters of terminals, printers, graphics processors and so on.

However, host channel expanders service remote clusters as though they were directly attached to the host multiplexer or selector channels. The advantage of that connection scheme is that data can be transferred at extremely high speeds and response times are greatly reduced.

In addition, the expander permits direct channel-to-channel communication between hosts. Currently, Auscom, Inc., NTX Communications Corp. and Paradyne Corp. offer host channel expanders.

Network processors

Network processors are much like front-end processors in that they also contain programmable microprocessors, line interface modules, communications scanners, protocol converters and network control facilities. The network processor, however, does not connect directly with the host, nor does it carry on a dialogue with the front-end processor. It carries out its functions with almost total autonomy from the host, which permits the network processor to adapt to any host environment easily.

> *“The network processor does not connect directly with the host.”*

Network processors do, however, respond to front-end processor-initiated network signals. A network processor is a multiplexer with line interface modules, or I/O ports, that connect asynchronous and synchronous data, and transmit them over one or more composite high-speed links to target end points within the network.

The I/O ports are user-programmable for data rates and codes, and ports can connect terminals on a one-to-one basis or multiplexed inputs can be accommodated.

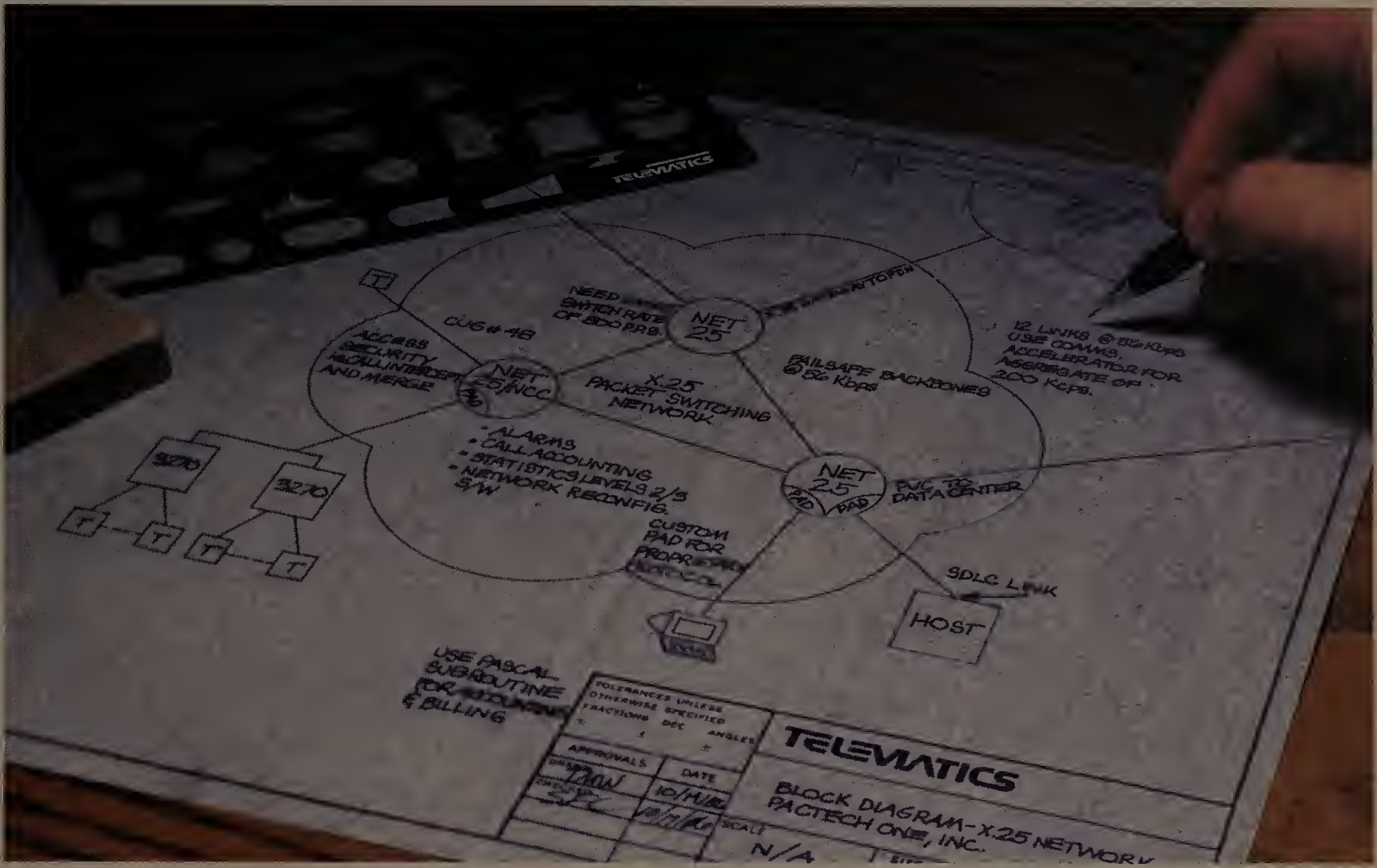
In the latter case, the I/O port is in a multiplexer card. Network processors have many user-programmable high-speed — typically 9.6K bit/sec — composite links. The link termination points are dynamic and can be easily changed by the operator from the network processor control console. This level of flexibility allows trunk configurations and end points to be changed as applications or operating conditions dictate.

> *“Host channel expanders service remote clusters as though they were directly attached to the host multiplexer or selector channels.”*

Network processors are not tied to any one particular mainframe vendor's communications protocol. Rather, most communicate with front-end processors at the data link level.

With IBM Systems Network Architecture, that data link level would be

See **Processors** page 37



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TELEMATICS
Programmable Networking Systems

Vendor	Model	Product type	Host computer	Number of host interface ports	Front-end processor emulated	Number of communications lines	Highest rate per line (bit/sec)	Protocols	Minimum price
Advanced Computer Communications **Santa Barbara, Calif.**	ACP 6250	FEP, NP	DEC VAX	1	NA	1	1K packets	X.25	$6,490
Amdahl Corp. **Sunnyvale, Calif.**	4705E	FEP	Amdahl 470, 580, 5890; IBM S/360, S/370, 43XX, 30XX	6	IBM 2705, 3705	352	64K	BSC, SDLC, HDLC, X.25, X.21, async.	$60,000
	4705T (T-1 support)	FEP	Same as 4705E	96	IBM 2705, 3705	352	64K	BSC, SDLC, HDLC, X.25, X.21, async.	$40,000
Amnet, Inc. **Framingham, Mass.**	Nucleus 6000	NP	Any supporting OSI, X.25, X.75	1 to 1,024	NA	1,024	64K	Async., sync., BSC, Burroughs Poll/Select, X.25, X.75	$15,000
Auscom, Inc. **Austin, Texas**	8911A Host Channel Extender	FEP	IBM S/360, S/370, 30XX, 43XX	NA	NA	Quote	Quote	HDLC, IEEE 802.3	Quote
BBN Communications Corp. **Cambridge, Mass.**	C/300 PSN	NP	Any supporting X.25	NA	NA	64	64	X.25 Level 3, X.75, X.121, Dept. of Defense	On request
Burroughs Corp. **Detroit, Mich.**	CP 2000	FEP, NP	Burroughs, B5900, B6900, B7900, Series A2-A15	1	NA	48	64K	Burroughs Standard Poll/Select, async., IBM 3270 BSC, SDLC, SNA, HDLC, X.25	$13,500
	CP 9585	FEP, NP	All Burroughs; IBM S/360, S/370, 303X, 308X, 43XX	2	NA	128	56K	Burroughs Standard Poll/Select, async., IBM 3270 BSC, SDLC, SNA, HDLC, X.25	$70,000
Cableshare, Inc. **London, Ontario**	LSI Front-end processor	FEP	All DEC	1	NA	Quote	19.2K	Async., X.25	$13,000
Case Communications, Inc. **Columbia, Md.**	DCX 850	NP	Any	NA	NA	240	9.6K	Async., BSC, SDLC, X.25, HDLC	$10,000
Century Analysis, Inc. **Pacheco, Calif.**	OSI	FEP, NP	NCR 85XX family	12	NA	24	19.2K	Async.	$5,600
Chi Corp. **Cleveland, Ohio**	CCP/3210	FEP, NP	Sperry 1100	8	Sperry DCP	1,000 (approx.)	64K	Sperry UTS, IBM 3270 BSC, TCP/IP, async., X.25	$85,000
Codex Corp. **Mansfield, Mass.**	Model 6760	NP	Any	NA	NA	256	19.2K async.	Async., sync., BSC, SDLC, HDLC, Burroughs Poll/Select	$20,000
Computer Communications, Inc. **Torrance, Calif.**	CCI 8400 T1	FEP	IBM S/370, 30XX, 43XX; Amdahl 470	4	IBM 270X, 27X5	4 T-1 lines	1.544M	BSC, HDLC	$56,000
Control Data Corp. **Minneapolis, Minn.**	CDC Net	FEP, NP	CDC Cyber Series	2	NA	32/module	256K	Async., BSC, HDLC, TCP/IP	$15,000
Digital Communications Associates, Inc. **Alpharetta, Ga.**	DPAX	NP	Any supporting X.25	NA	NA	80	19.2K	Async., X.25 Level 3	$5,200
GTE Telenet Communications Corp. **Vienna, Va.**	TP 4000	NP	Any supporting X.25	NA	NA	128	56K	Async., BSC, HDLC, X.25 Level 3	$37,000
Honeywell Information Systems, Inc. **Waltham, Mass.**	Datanet 8/10	FEP, NP	Honeywell family	3	NA	31	56K	Async., sync., Honeywell VIP, IBM BSC, SDLC, X.25, X.29	$24,000
	Datanet 8/20	FEP, NP	Same as Datanet 8/10	4	NA	127	56K	Same as Datanet 8/10	$38,000
	Datanet 8/30	FEP NP	Same as Datanet 8/10	4	NA	255	56K	Same as Datanet 8/10	$80,000
IBM **White Plains, N.Y.**	3710-1	NP	IBM S/370, 30XX, 43XX	NA	NA	32	64K	Async., SDLC, X.25, BSC	$20,000
	3720	FEP, NP	IBM S/370, 303X, 308X, 43XX	2	IBM 3705, 3725 270X	60	256K	BSC, SDLC, X.25, X.21bis, async.	$26,000
	3725, Model 2	FEP, NP	IBM S/370, 303X, 308X, 43XX 309X	2	IBM 270X	256	256K	Async., BSC, SDLC, X.25, X.21bis	$65,550
Infotron Systems Corp. **Cherry Hill, N.J.**	990NP	NP	Any	NA	NA	640	19.2K async., 64K sync.	BSC, SDLC, HDLC, async., Burroughs Poll/Select, X.25, Honeywell VIP and GRTS	$12,000
Lemcom Systems, Inc. **Phoenix, Ariz.**	CMC	FEP	IBM S/360, S/370, 303X, 43XX, 308X	32	IBM 270X, 370X EP	32	56K	BSC, async., custom	$10,000
	DNP	FEP, NP	Same as CMC	32	IBM 270X, 370X EP	6,500	57.6K	BSC, SDLC, HDLC, async., custom	$18,000
Memotec Data, Inc. **St. Laurent, Quebec**	MPSN 8000	NP	Any supporting X.25	NA	NA	54	64K	BSC, SDLC, DEC VT, X.28, X.3, X.29, Burroughs Poll/Select, X.25 Level 3	$1,695
Micom Systems, Inc. **Simi Valley, Calif.**	MB3	NP	Any async.	NA	NA	10	19.2K	Async., X.25	$5,400
NCR Comten, Inc. **St. Paul, Minn.**	5620	FEP, NP	IBM S/360, S/370, 303X, 308X, 309X, 43XX; NCR V-8500, V-8600, V-8800, V/E-9800	2	IBM 3720,3705, 3710, 3725, Model 2	32	64K	BSC, SDLC, HDLC, async., X.25, X.21	$50,000
	5660	FEP, NP	Same as 5620	8	IBM 3725, 3705, 3710	1,024	256K	Same as 5620	$310,000
NTX Communications Corp. **Sunnyvale, Calif.**	NTX 3800 Host Channel Extender	NP	IBM S/370, 303X, 308X, 43XX	NA	NA	4	6M	SDLC-like; switches host processors	$76,000
Paradyne Corp. **Largo, Fla.**	Pixnet-XL Host Channel Extender	FEP, NP	IBM S/370, 30XX, 43XX	NA	NA	12	2.048M	HDLC	$56,000
Periphonics Corp. **Bohemia, N.Y.**	Voicepac	NP	IBM S/360, S/370, 30XX, 43XX; DEC; Burroughs; NCR	7	NA	80	56K	IBM 3270 BSC, 3780, Burroughs Poll/Select, NCR, DEC VT 52, 100, 200, push-button telephone	$25,000
Protocol Computers, Inc. **Woodland Hills, Calif.**	SmartNet	NP	Any	NA	NA	27	19.2K	Async., SDLC, X.25	$4,000
Sperry Corp. **Blue Bell, Pa.**	DCP/15	FEP, NP	Series 90, 1100 and 2200	4	NA	52	64K	Async., sync., Sperry UTS, X.25, SNA, HDLC, DD, DDN, REM-1	$15,000
	DCP/40	FEP, NP	Same as DCP/15	3	NA	1,000	64K	Same as DCP/15	$85,000
Tandem Computers, Inc. **Cupertino, Calif.**	Model 6100	FEP	All Tandem	6	NA	180 async., 45 sync.	19.2K async., 56K sync.	Any async., sync., IBM 3270 BSC, Sperry UTS, Burroughs Poll/Select	$16,000

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Vendor	Model	Product type	Host computer	Number of host interface ports	Front-end processor emulated	Number of communications lines	Highest rate per line (bit/sec)	Protocols	Minimum price*
Telematics International, Inc. **Ft. Lauderdale, Fla.**	Series 2000	NP	Any	NA	NA	480	230K	Async., sync., BSC, SDLC, X.25	$50,000
Timeplex, Inc. **Woodcliff Lake, N.J.**	Networking Microplexer	NP	Any	NA	NA	144	19.2K	BSC, SDLC, async., Burroughs Poll/Select	$13,800
Tri-Data **Mountain View, Calif.**	Netway 200	NP	Any	4	NA	32	9.6K	Async., BSC	$1,000/ terminal port
Tymnet/McDonnell Douglas Network Systems Co. **San Jose, Calif.**	Mini Engine	NP	Any supporting X.25	NA	NA	64 async, 32 sync.	4.8K async., 64K sync.,	BSC, SDLC, async., HDLC, X.25	$30,000
Vitalink Communications Corp. **Mountain View, Calif.**	NP III	NP	Any	NA	NA	16	1.544M	Async., SDLC, HDLC, Burroughs Poll/Select, X.25, TCP/IP, XNS, 802.3, 802.5	$30,000

SOURCE: TMS CORP., DEVON, PA., AND FAULKNER PUBLISHING INC., PENNSAUKEN, N.J.

* Some vendors, especially IBM, levy a monthly charge for the use of software.

HDLC = High-Level Data Link Control
SDLC = Synchronous Data Link Control
BSC = Binary Synchronous Communications
OSI = Open Systems interconnect
TCP/IP = Transmission Control Protocol/Internet Protocol
SNA = Systems Network Architecture
DDN = Defense Data Network
UTS = Universal Terminal System
XNS = Xerox Network System
FEP = Front-end processor
NP = Network processor
NA = Not applicable

Processors from **page 35**

Synchronous Data Link Control Level 2; it is also Level 2 for the Open Systems Interconnect model, High-Level Data Link Control and X.25. Four vendors — BBN Communications Corp., Digital Communications Associates, Inc., GTE Telenet Communications Corp., and Memotec Data, Inc. — claim X.25 Level 3 capability, allowing their products to handle routing between users and also to control data flow.

X.3 defines PAD parameters and their functions in the translation between X.25 procedures and the terminal's native mode of operation. X.28 defines the way a terminal and PAD connect while X.29 defines the interaction between the PAD as an X.25 subscriber and the X.25 connection at the other end of the call. X.75 provides a protocol definition for internetwork gateways to allow device connection between different networks.

> *“Four vendors claim X.25 Level 3 capability, allowing their products to handle routing between users and also to control data flow.”*

All network processors provide good capabilities in the areas of network management and control. From a central control console, the operator can monitor traffic throughout the network and initiate local and remote loop-back tests to check out system components down to and including the channel level.

The details of network operating statistics vary among vendor products, but just about all collect data showing traffic loading, line hits and line outages. Many will also log errors generated by communications devices like modems and multiplexers. If used properly, these reports will allow system managers to identify potential problems because of traffic overloads and will also show which lines are being underused at what times.

Remote concentrators reside at user locations and are used to connect terminals, printers and per-

See **Processors** page 40

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Processors from **page 37**

sonal computers with the host processor's front-end processor or with network processors. Although network processors and front-end processors can also be used as remote concentrators, that would be expensive overkill.

The most widely used and emulated remote concentrators are the IBM 3270 series, consisting of the now discontinued Models 3271 and 3272 and the currently marketed 3174, 3274 and 3276 systems. The 3270 series are clustered terminal device controllers with I/O adapters for accommodating up to 32 colocated terminals and/or printers. No provision is made for dial-in terminals — a decided limitation with this system.

The 3270 controller polls the attached terminals and frames their outputs into a message for multiplexed transmission to the host over a single communications link at speeds up to 56K bit/sec. The remote versions of the 3270, called the C-Models, connect with the front-end processor and are under its control.

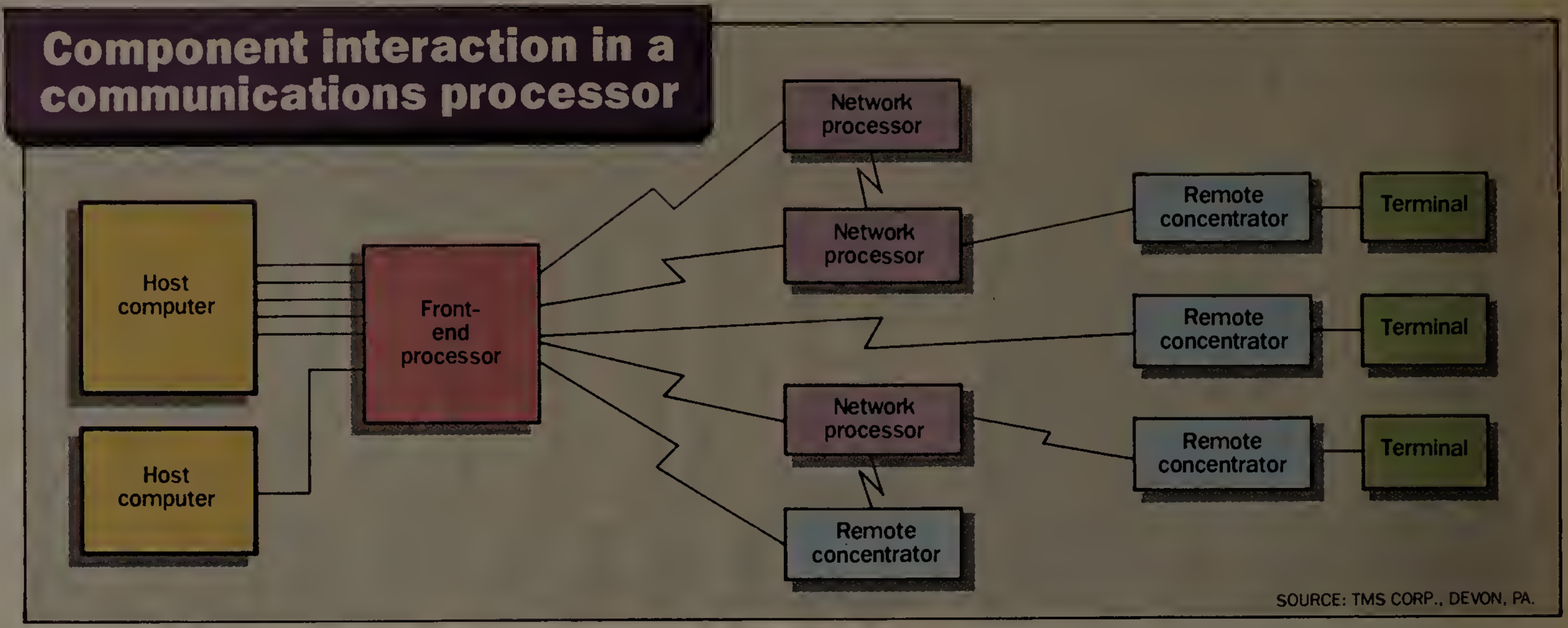
The 3270 controller also demultiplexes composite messages from the front-end processor and directs them to the target terminal or printer.

The leading vendors in the IBM 3270 emulation market are AT&T Information Systems in Neptune, N.J., Beehive International in Salt Lake City, Braegan Corp. in Cupertino, Calif., Davox Communications Corp. in Billerica, Mass., Harris Corp.'s Data Communications Division in Dallas, ITT Courier in Tempe, Ariz., Lee Data, Inc. in Minneapolis, Memorex Corp.'s Communications Group in Cupertino, Calif., NCR Corp. in Dayton, Ohio, and Telex Computer Products, Inc. in Tulsa, Okla. All vendors offering 3270 emulated systems typically follow IBM specifications feature for feature.

> *“Although network processors and front-end processors can also be used as remote concentrators, that would surely be expensive overkill.”*

The notable exceptions are Lee Data Corp. and Telex Corp. Both differ from IBM in that they offer products with two composite links that can be targeted to two sepa-

Component interaction in a communications processor



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That translates into a binary file transfer speed of nearly 13 K characters per minute—or over six pages worth. Now imagine the impact that can have on your long distance telephone bill.

But these new modems aren't just fast, they're also versatile. They can both send and receive data asynchronously at speeds ranging from 2,400 bps down to 75 bps.

Both modems are compatible with the popular "AT" command set, as well as the IBM command set. And they have been tested for compatibility with leading PC communications software such as Crosstalk™ XVI, Microsoft® Access, Kermit, Smartcom® and Smartcom II®

rate remote host locations. This saves the users the expense of purchasing a different 3270 to service each location. Lee Data also offers a controller that provides separate links for local attachment directly to the host.

Astrocom Corp., located in St. Paul, Minn., has recently introduced Easy II, an IBM 3270 cluster controller management system that allows users to contend for ports on up to three 3274 controllers on a priority, direct connect or closed user-group basis.

Easy II supplies the priority terminal handling scheme missing from the 3270 and its clones.

At least 50 vendors offer products that emulate the 3270 cluster controllers and their terminals/printers through protocol conversion. Those units allow the substitution of lower cost ASCII devices in place of the more expansive IBM offerings.

> *“It is interesting to note that a few vendors are now offering interfaces to Ethernet local-area networks. This appears to be the new applications frontier for networking. With the growing use of distributed data bases, there must be a way to bridge local networks with other local networks that are miles apart.”*

Although protocol converters have not been included, the leading vendors are the following: AST Research, Inc., located in Irvine, Calif.; Avatar Technologies, Inc. in Hopkinton, Mass.; Carterfone Communications Corp., located in Dallas; Cleo Software in Rockford, Ill.; Datastream Communications, Inc., located in Santa Clara, Calif.; Digital Communications Associates, Inc. in Alpharetta, Ga.; Forte Communications, Inc. in San Jose, Calif.; Innovative Electronics, Inc. in Miami; and Local Data, Inc. in Torrance, Calif.

Future uses

It is interesting to note that a few vendors are now offering interfaces to Ethernet local-area networks. This appears to be the new applications frontier for networking.

With the growing decentralization of data processing and the increased use of distributed data bases and local-area networks, there must be a way to bridge local networks with other local networks that are miles apart.

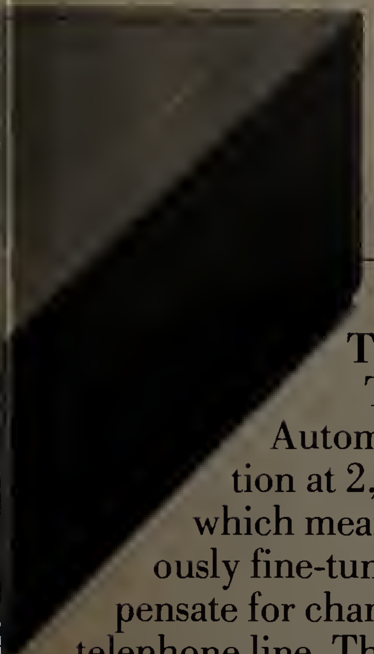
> *“Some users are employing broadband to carry an entire baseband composite.”*

The current Ethernet baseband specifications limit a network's length to 2.5K meters (approximately 8,333 feet). To extend it, buffered repeaters and filter bridges are available, and some users are employing broadband local net channels to carry an entire baseband composite.

Not the answer

However, some systems professionals say that these schemes are not the answer to long-distance communications because of performance degradation. It could be that the current crop of network processors might be able to provide the wide-area link needed to join local nets, but, to do so efficiently, most will have to get their data-handling speeds up to those supported by the local net backbone.

Depending on which local network technique is chosen, those speeds range from 1M bit/sec to 10M bit/sec. Although those speeds are currently more specification than actual application, file transfers in the 1M bit/sec range are common on local nets. Network processors will have to support at least that data rate to be effective.



or

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The IBM Personal Computer 2,400 bps Modem.

The Automatic Modems
These modems feature Automatic Adaptive Equalization at 2,400 and 1,200 bps—which means they will continuously fine-tune themselves to compensate for changes and noises on the telephone line. The result is, you can receive data over a wider range of telephone line conditions.

Both modems also feature automatic or manual answering and dialing. They'll automatically switch to pulse dialing if tone dialing doesn't work. They have automatic redialing. And once a connection is made, automatic speed detection. They also have automatic detection of a voice or a failed call.

A Modem with a Memory of Its Own
The stand-alone IBM 5842 2,400 bps Modem offers some additional features. It can also send and receive data synchronously at speeds of 2,400 bps or 1,200 bps. You'll find extensive “Help” menus. A dial directory for 20 phone numbers. A log-on directory for five log-on sequences. A built-in pattern generator for self testing. Diagnostics implemented from the front panel as well as from the computer keyboard. And a complete array of LED Status Indicators to give you a quick visual check on what's happening.

Which One Is for You?
The internal IBM Personal Computer 2,400 bps Modem is designed to occupy a half slot in the IBM PC, XT, AT and 3270 PC.

The stand-alone IBM 5842 2,400 bps Modem is compatible with all models of IBM Personal Computers. And, in addition to the features mentioned above and its internal power supply, the significant difference is that a stand-alone modem can be moved from PC to PC more easily than an internal modem.

If you feel that 2,400 bps is more modem than you need, we also offer the stand-alone IBM 5841 1,200 bps Modem, and the internal IBM Personal Computer 1,200 bps Modem.

For the Authorized IBM PC Dealer nearest you—or for free literature on the IBM family of PC Modems—call 1 800 IBM-2468, Ext. 596/EM. Or you can contact your IBM marketing representative.

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Connection from **page 28**

from the workings of its own internal network of computers, would be a perfect tool to control such network interconnections."

But lest anybody get too excited, there's a hitch to this story. Despite a $40 million Pentagon investment in building the new supercomputer and despite the fact that the Connection Machine is already crunching data, massive parallel processing sophisticated enough to manage communications networks is still many years away.

"I don't expect to see anybody being able to go out and buy a parallel processing supercomputer for complicated day-to-day applications like communications networks until at least the mid-1990s," according to Eric Knudsen, a researcher at Gartner Group, Inc., in Stamford, Conn.

"The hardware may be available soon, but the software is far from ready.

"More importantly, the algorithms — the very problem-solving equations that lead to the development of software — are a long way from being devised."

Users will be hearing more in the coming years about supercomputers with massive parallel processing capabilities and how these machines can be a boon to communications networking.

But users should take these statements as a window into the future and nothing else. In this case, the future is still a long way off.

> *"Despite a $40 million Pentagon investment in building the new supercomputer and despite the fact that the Connection Machine is already crunching data, massive parallel processing sophisticated enough to manage communications networks is still many years away."*

Regulation from **page 29**

law of the land and that competition and deregulation are already in place for the BOCs.

However, if and when the line-of-business restrictions are abolished, new rules will be imposed upon the BOCs telling them how and under what circumstances they may enter equipment manufacturing and information services. And, of course, new rules must be modified, generating more valuable billing time for Washington, D.C. lawyers.

> *"The nation's lawyers — both in and out of the government — have a vested interest in continued, and perhaps even perpetual, regulation."*

It is extremely unlikely that the regulatory restraints imposed on the telecommunications industry by the Communications Act of 1934 will be lifted or abolished soon.

Why? Because the nation's lawyers — both within and outside of the government — have a vested interest in continued, and perhaps even perpetual, regulation. It would be unusual if one group of lawyers, namely Congress, instructed a second group of lawyers, such as the FCC, to abolish rules governing the BOCs, AT&T and others, many of whose lobbyists and top executives are lawyers.

If that were to happen, there would be a horde of unemployed lawyers, and their enormous power would diminish.

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Chuck Boucher, President, General Technology Inc.

"My customers—largely Fortune 500 companies—read *Network World.* Consequently, that's where I want to advertise."

Chuck Boucher is president of General Technology Inc., a company based in Melbourne, Florida. They manufacture Balun concentrators and station units, devices which eliminate the need for expensive coaxial cable—and they design and install network control/management systems.

"My customers—largely Fortune 500 companies—read *Network World.* Consequently, that's where I want to advertise," says Chuck. "When I asked them why they read it, they said that *Network World* is the only publication written for users—an idea that they felt was long overdue. They said that *Network World* gives them the best coverage of network control and management, LANs, communications software and T carriers—all areas of interest to General Technology and our customers," he explains.

General Technology Inc. began advertising in *Network World* in September. "The ad—black-and-white measuring 2 columns by 10 inches—ran once, and the response was overwhelming. There were countless requests for product literature and demos—plus 30 solid sales leads. We even had to pull the ad for two weeks to get caught up," says Chuck. "But we're running again," he adds, "because, based on all the responses, we know *Network World* is talking to the right people."

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The bug stops here

RICH TENNANT

(part 2)

BY JOHN F. O'NEILL
Special to Network World

Second in a two-part series.

The categories of information needed to support management of a data transmission facility are the same as those required for a voice network.

O'Neill is president of OneCom, Inc., a Boulder, Colo., supplier of transmission facility management systems.

They include information on facility usage, facility availability, transmission and signaling quality, and fault segregation (for a discussion of voice network management, see part 1 of this series, *Network World*, Nov. 10).

A fifth category, debug and facility alignment information, is valuable because the users who own any terminal equipment or transmission facilities can be considered as their own carriers, at least for those lines served by their equipment (see related story on page 51).

Data-oriented networks frequently require highly specialized systems for facility management. However, some of the voice net-

☞ See **Management** page 48

Management from **page 47**

work information gathering tools also apply to data networks that are based on analog voice or wideband facilities.

For example, tone-routining systems perform automatic transmission testing in off-traffic hours and generate detailed transmission-quality profiles of each analog line. They also assist in fault segregation.

Combined traffic and transmission facility monitors, also termed "active monitors," look at both the signaling state and speech or data energy on the analog facilities. They can remotely report on usage, availability and quality, discriminate data calls from voice calls on shared trunks and can serve as a remotely controlled transmission measuring set (TMS).

> *"Combined traffic and transmission facility monitors, also termed active monitors, look at both the signaling state and speech or data energy on the analog facilities. They can remotely report on usage, availability and quality, and discriminate data calls from voice calls on shared trunks."*

Informational toolbox

The table on Page 51 lists the methods and tools available to gather information on data networks. Because a richer variety of tools and methods are available in data communications than in the voice environment, this is only a general survey of them, rather than a blow-by-blow comparison.

> *"For determining transmission facility availability, the principal tools are the facility monitors and the performance data from the mainframe or network control entity."*

For facility usage information, the available tools, in increasing order of precision and timeliness, are user complaints, facility monitors (whether active or traffic-only) and the usage records from the host computer or network controller system, if applicable.

For networks that have a switching point beyond the data network controlling entity, the facility assignment process may be invisible to that controller, and facility monitors play an important role.

For determining transmission facility availability, the principal tools are the facility monitors and the performance output data from the data mainframe or network control entity.

In the latter case, the information will generally reflect the bit error rate observed end-to-end. Although this is what the manager cares about, its weakness is that a gradual deterioration of transmission quality is not reflected in a change in error rate until it reaches an advanced state. It's similar to assuming that a person is perfectly healthy as long as he's still walking around.

In view of this possibility of gradual transmission-quality degradation, the end-to-end bit error rate is not the strongest line-quality indicator.

Is a private
network
from N.E.T.
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This information is output from the data-controlling entity, such as a cluster controller, mainframe or front-end processor.

A facility monitoring system with data signal analysis capability is somewhat better than a measurement based on a pure end-to-end bit error rate. An even better solution is a complete testing capability using loop-around bit error rate and parametric testing of all elements of the network.

> *“Parametric testing includes signal level, noise, jitter, phase and amplitude hits, linear phase and gain distortion, and modem integrity. This capability can be had only when the network is closed, that is, when all transmitters and receivers are on the network. It does not apply for open networks, where one end of a call is not on the net. In such nets, the facility monitor is the only tool applicable.”*

Parametric testing includes signal level, noise, jitter, phase and amplitude hits, linear phase and gain distortion, and modem integrity. This capability can be had only when the network is closed, that is, when all transmitters and receivers are on the network.

It does not apply for open networks, where one end of a call is not on the network. In such networks, the facility monitor is the only tool applicable.

Many tools are available for gathering fault segregation information, but they differ radically with the type of data network.

For an open-voice-band, dial-up network, a modem wraparound device will assist in detecting failed modems, thereby isolating the problem from a failed transmission line. For closed data networks using private transmission facilities, complex loop-around tests involving both bit error rate and parametric testing are highly effective in isolating a fault to a terminal device or a transmission link.

> *“Many tools are available for gathering fault segregation information. For an open-voice-band, dial-up network, a modem wraparound device will help detect failed modems.”*

Suppliers of network management systems compete, in part, on the power and coverage of their diagnostic and service restoration methods, and a rich set of tradeoffs is available to the network manager. But good diagnostics are much easier to build in during network construction than they are to add later.

Other important criteria to consider when comparing and selecting facility management tools include universality of application, cost, flexibility and resistance to obsolescence.

No scheme for gathering information on data or voice networks is

See **Management** page 50

Just ask

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Data facility manager's information needs and data sources

Information needs	← Imprecise, slow		Precise, fast →
Facility usage	User complaints	Facility monitor	Network controller/ computer records
Facility availability	Facility monitor	Network controller/ computer records	
Transmission quality	End-to-end bit error rate	Facility monitor	Loop-around BER and parametric tests
Fault segregation	Modem wrap-around	Loop-around BER and parametric tests	

SOURCE: ONECOM, INC., BOULDER, COLO.

Carriers' information needs and data sources

Information needs	← Imprecise, slow		Precise, fast →	
Debug and align facility (digital)	Facility diagnostics from PBX	Facility monitor	Tone tester	Analog TMS instruments
Debug and align facility (analog)	Facility diagnostics from PBX	Digital facility monitor	Loop-around BER and parametric tests Data TMS instruments	

BER = bit error rate TMS = transmission measurement set

SOURCE: ONECOM, INC., BOULDER, COLO.

Management from **page 49**

truly universal in application, but some methods provide more information in more categories than do others.

Also, in addition to the tools and methods discussed here, some types of switch and terminal equipment have built-in facilities to generate usage information.

For example, users should take advantage of traffic information generated by their call-accounting systems.

Tone testing falls short

Among additive facility maintenance schemes, the tone testing approaches tend to be unable to test incoming-only facilities — the test call simply can't be made from the location of the tone tester.

In addition, tone testers that access lines via the private branch exchange test port are limited by the availability and capabilities of the test port itself; not all the switch makers approach this port the same way.

> *"The active facility monitor approaches universality of application: It doesn't use the PBX at all and can derive information from incoming or outgoing lines."*

Moreover, no standard exists for interfacing test ports.

The active facility monitor approaches universality of application: It doesn't use the PBX at all and can derive information from incoming or outgoing lines, whether private leased lines or access lines to public networks, such as WATS and foreign exchange lines.

The table on Page 51 illustrates how useful voice/data management tools are in gathering information in each of the facility-management information categories.

As is shown, some of the systems provide only one type of input,

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while others cover several areas.

Depending on the communications manager's particular information needs, some management tools will perform better than others.

> *"System vendors primarily serving the private network manager will strive to upgrade their systems as facilities evolve toward digital. Vendors serving primarily the telephone utility market may not be as responsive to the needs of the network manager as they are to their telecommunications customers."*

Keep maintenance costs in check

The cost of fully equipping a network with maintenance tools depends on the configuration, the degree of precision, the timeliness required and the tools and methods selected.

The timeliness is affected by the use of the network in the corporate organization.

A reasonable expectation is that a system of maintenance tools may cost 5% of the value of the rest of the system. Another method of figuring the cost of maintenance tools is basing it roughly on one or two months' lease charges for the facilities.

Applicability of facility management tools and methods

Tools and methods	Information categories Facility usage	Facility availability	Transmission quality	Fault segregation	Align and debug facility
Manual methods	Small only	Weak	—	—	—
PBX (SMDR) and diagnostics	Trunk group only	Fair to good	—	—	—
Tone testing from PBX test port	—	—	Good	Fair	Good
Tone testing with metallic access	—	—	Good	Good	Good
Traffic/transmission facility monitor	Good	Good	Good	Fair	Fair
Facility monitor/ tone tester	Good	Good	Good	Good	Good
(TMS), data analyzer	—	—	—	Good	Good

SMDR = station message detail recording TMS = transmission measurement set SOURCE: ONECOM, INC., BOULDER, COLO.

Generally, system vendors primarily serving the private network manager will strive to upgrade and improve their systems as facilities evolve toward digital and as other trends develop.

Vendors serving primarily the telephone utility market and having private networks as a sideline may not be as responsive to the needs of the network manager as they are to their telecommunications customers.

Consider a consultant

Also, consultants may be helpful in developing concepts for an appropriate transmission facility management system.

A well-conceived facility management system will pay its way in savings on labor and bad line charges, greater information throughput and fewer lost revenue-bearing calls (such as incoming WATS order lines), as well as fewer trips to the ulcer specialist.

The trick is to select appropriate tools that do not underperform, become obsolete or waste the user's investment. ☑

Some users should take the carrier perspective

Many corporate networks own their terminal apparatus and even their transmission facilities and so can be viewed as having some of the same needs as telecommunications carriers. The carrier's viewpoint differs from that of the network manager, except that both must be able to perform fault segregation accurately between transmission and switching equipment.

Once fault segregation has been determined, the carrier's next step is to determine which segment of the facility is faulty. This requires a facility debug and alignment capability. Debug information helps locate faulty transmission links or equipment. Align information is used for setting up a new or repaired transmission facility in terms of proper gain vs. frequency, termination and so on. For networks in which the switches and transmission lines are from different vendors, this information can solve the "finger pointing" problem.

The carrier needs the detailed line performance data usually associated with tone testing (for voice) or data transmission analysis (for data) in order to debug a problem, fix it and realign the facility. The network manager generally doesn't need this detail.

The Carrier Information Needs table differentiates the cases for analog transmission facilities and digital transmission facilities. For analog transport systems, debugging and alignment processes can use the facility diagnostic messages from the private branch exchange, information from facility monitors and data from tone testing/routining systems. Both the PBX and the monitors give the carrier the customer point of view.

> *"Once fault segregation is clear, the carrier must determine which segment of the facility is faulty."*

The ultimate weapon in facility debugging and alignment is the analog Transmission Measurement Set (TMS). TMS instruments come in both voice and data variations. Use and operation are technical jobs.

For digital transport systems, the tools, in order of precision, are facility-oriented diagnostics from the PBX, the output of a digital facility monitoring system, and the ultimate loop-around bit error rate and parametric test capability integrated with the network. Interestingly, the oldest telephone utility digital transmission system, T-1, can loop around diagnostic information at span repeaters under remote control.

The new class of intelligent digital multiplexing equipment, usually called digital resource managers, has a high level of built-in error rate control on its facility sides; a complete system might well include monitoring or other maintenance capability on the customer side of these devices.

— John F. O'Neill

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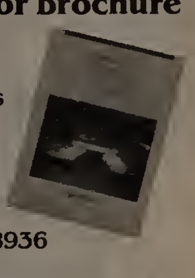

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▶LOCAL/NET '86

Bridge to debut Token-Ring/host link

BY MARY PETROSKY
West Coast Correspondent

SAN FRANCISCO — Bridge Communications, Inc. is expected to introduce tomorrow at the Local/Net '86 show terminal emulation and file transfer software designed to allow IBM Personal Computers and compatibles on an IBM Token-Ring Network to communicate with a variety of non-IBM hosts.

The $300 package, called TokenTerm, will allow personal computer users attached to an IBM Token-Ring Network to emulate a variety of terminals and share resources with devices connected to Bridge's CS/1-TR Token Ring Communications Server. Introduced last June, the CS/1-TR attaches to the network and supplies connections for up to 64 personal computers, asynchronous and 3270 terminals, printers, modems, and ASCII and IBM hosts.

TokenTerm emulates teletypewriter terminals as well as Digital Equipment Corp. VT100 and VT52 terminals. It also contains a program interface that allows terminal emulation programs from third-party vendors to run over the network.

Bridge has tested a number of such packages with TokenTerm, including software from Walker Richer & Quinn, Inc., Grafpoint, Performance Consulting Group and Persoft, Inc., whose products provide emulation for terminals from Hewlett-Packard Co., Tektronix, Inc., Data General Corp. and DEC.

The TokenTerm software consists of Xerox Network Systems protocols overlaid with menu-driven terminal emulation and a file transfer application. By handling the protocols and communication software, Bridge is making it easier for third-party vendors to run their terminal emulation products over the Token-Ring Network. However, users must run TokenTerm in conjunction with the third-party program.

"The primary effort in TokenTerm is the communication software needed to communicate across the network," said Keith Cheney, product manager. "A lot of vendors have concentrated on the PC to IBM [host] connection. IBM will provide good solutions between the PC and the mainframe — our emphasis is on the ability of the PCs on a Token-Ring to access devices other than IBM equipment," he said.

TokenTerm supports straight ASCII transfer and the XModem file transfer protocol. The package also contains a script facility, which allows users to save predefined connection and file transfer sequences. System requirements for TokenTerm include an IBM Token-Ring Adapter Card, 80-column display, 384K bytes of memory and PC-DOS Version 3.2 or later. ◻

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Letters:

Overrated importance

I was astonished to read your product review in the Oct. 20 issue of *Network World*, "Emulation to communications, protocol converters mature." It makes a bold claim that two vendors dominate the market for protocol converters: Digital Communications Associates, Inc. and AST Research, Inc. You will get no argument from me on the first vendor. What evidence do you supply to back the claim on AST's dominance in this market?

If you take a look at AST's financial statements, you would note that even in the past year, memory and multifunction board products account for over 75% of their business. The remainder is divided among communications products, disk drives, printers and Apple Computer, Inc. products. I would argue that AST holds a marginal presence in the market for protocol converters and is certainly not a dominant player.

In the interest of fairness, I would expect *Network World* to supply independent data to back a claim as strong as that expressed in your product review column. There are many companies other than AST that hold a stronger position in this market.

Nora Feldman Gildea
Director of marketing
Ideassociates, Inc.

Letters may be edited for space and clarity.

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1

My primary areas of activity. (Circle ONE only)
I am involved in evaluating communications (data, voice and/or image) products and services:
1. for *use within my own* company/organization
2. for *resale* to other companies/organizations
3. Both
4. Other (explain) ____________________

1a

For communications, my primary responsibility is: (Circle ONE only)
1. Data Communications
2. Voice Communications
3. Both
4. Other (explain) ____________________

2

Circle only the ONE title classification which most applies to you.

Company Management
- 11. Chairman, Pres., Owner, Gen. Mgr., Partner, Director, CEO, VP, Dir. Head of Finance, Admin. Procurement

Communications Management

Data Communications
- 21. Management
  VP, Dir., Mgr., Head, Chief: Data Communications, including Networks, Engineering, Design, R&D, Application Development
- 22. Supervisory/Staff:
  Supervisor, Head: Networking, Design, Analysis, Engineering, R&D, Applications, Services

Telecommunications
- 31. Management
  VP, Dir., Mgr., Head, Chief: Telecomm., Voice Comm., including Networks. Engineering, Design, R&D, Application Development
- 32. Supervisory/Staff: Supervisor, Head: Networks, Design, Analysis, Engineering, R&D, Applications Services

Factory Communications
- 41. Management
- 42. Supervisory/Staff

MIS/Data Processing
- 51. Management
  VP, Dir., Mgr., Head, Chief: MIS/DP, Systems Application Development, Operations, Office Automation
- 52. Supervisory/Staff: Supervisor, Head of Systems Design, Analysis Applications

Others
- 75. Consultant
- 80. Educator
- 85. Financial Analyst
- 90. Marketing/Sales
- 95. Other ____________________

3

Job Function
Which one of the following best describes your functional involvement with communications (data, voice, and /or video) products? (Circle ONE only)

Corporate
- 1. Business Management, Planning and/or Development

Communications System/Network
- 2. Management, Planning and/or Development
- 3. Implementation and/or Operation
- 4. Other ____________________

4

Which one of the following best describes the primary business activity of your organization at this location? (Circle ONE only)

Consultants
- 11. DP/Communications Consulting Services
- 12. Consulting Services (except DP/ Communications)

End Users
- 13. Manufacturer (other than computer/communications)
- 22. Finance/Banking/Insurance/Real Estate
- 23. Education
- 24. Medicine/Law
- 25. Wholesale/Retail Trade
- 26. Public Utility/Transportation
- 27. Mining/ Construction/ Petroleum Refining/ Agriculture/ Forestry
- 28. Business Services (excluding DP/Communications)
- 29. Government: Federal
- 30. Government: State/Local

Vendors
- 41. Carrier: including AT&T, BOCs, Independent Telcos, Public Data Networks, International Records Carriers
- 42. Interconnect
- 43. Manufacturer Computer/Communications Equipment
- 44. Value Added Reseller (VAR), Systems House, Systems Integrator
- 45. Distributor
- 46. DP/Communications Services (excluding consulting)
- 95. Other ____________________

5

In which ways do you typically become involved in acquiring communication products (data, voice, and/or video) and services? (Circle ALL that apply)
1. Recommend/Specify
2. Identify/Evaluate Potential Vendors
3. Approve the Acquisition
4. None of the Above

6

Check ALL that apply in columns A and B.
- A. I am personally involved in the acquisition process (specification, selection, approval) for the following products and services:
- B. These products and services are presently in use at this location:

	A	B	Product/Services
			Computers
01.	☐	☐	Micros
02.	☐	☐	Minis
03.	☐	☐	Mainframes
34.	☐	☐	Printers
			Data Communications
04.	☐	☐	Communications Processors
05.	☐	☐	Comm./Networks Software
06.	☐	☐	Digital Switching Equipment
07.	☐	☐	Facsimile
08.	☐	☐	Modems
09.	☐	☐	Multiplexers
10.	☐	☐	Protocol Converters
11.	☐	☐	Network Mgmt. & Control
12.	☐	☐	Test Equipment
13.	☐	☐	3270 Controllers
35.	☐	☐	Intelligent Terminals
			Telecommunications
14.	☐	☐	PBXs
15.	☐	☐	Key Systems
16.	☐	☐	Central Office Equipment
17.	☐	☐	Integrated Voice/Data Terminals

	A	B	Product/Services
			Transmission/Network Services Equipment
18.	☐	☐	Microwave
19.	☐	☐	Satellite Earth Stations
20.	☐	☐	Local Area Networks
21.	☐	☐	Wide Area Networks
22.	☐	☐	Packet Switching Equipment
23.	☐	☐	Fiber Optic Equipment
36.	☐	☐	T1
			Communications Services
24.	☐	☐	Packet Switching Services
25.	☐	☐	Cellular Mobile Radio Services
26.	☐	☐	Electronic Mail
27.	☐	☐	Enhanced Services
28.	☐	☐	Centrex
29.	☐	☐	Long Haul Services
30.	☐	☐	BOC Services
31.	☐	☐	Independent Telco Services
			Other
32.	☐	☐	Factory Communications
33.	☐	☐	Online Data Bases

7

Estimated value of communications systems, equipment and services:
- A. which you helped specify, recommend or approve in *last* 12 months? (Check only ONE in column A.)
- B. which you plan to specify,recommend or approve in *next* 12 months? (Check only ONE in column B.)

	A	B	
1.	☐	☐	$10 million and over
2.	☐	☐	$5 million - $9.9 million
3.	☐	☐	$1 million - $4.9 million
4.	☐	☐	$500,000 - $999,999
5.	☐	☐	$250,000 - $499,999
6.	☐	☐	$100,000 - $249,999
7.	☐	☐	$50,000 - $99,999
8.	☐	☐	Under $50,000
9.	☐	☐	Don't Know

8

Estimated gross annual revenues for your entire company/institution: (Circle ONE only)
1. Over $1 billion
2. $500 million to $1 billion
3. $100 million to $499.9 million
4. $50 million to $99.9 million
5. $10 million to $49.9 million
6. $5 million to $9.9 million
7. under $5 million

9

Estimated number of total employees at this location: (Circle ONE only)
1. Over 5,000
2. 1,000 - 4,999
3. 500 - 999
4. 250 - 499
5. 100 - 249
6. 50 - 99
7. 20 - 49
8. 1 - 19

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▶ COMDEX/FALL '86

Corvus offers low-cost net software

Fox, Santa Clara and 3Com also make local net news.

BY PAM POWERS
Senior Editor

LAS VEGAS, Nev. — Comdex Fall '86 spotlighted a few choice local-area network-related announcements last week, highlighting the scramble for end-user dollars as competition in the local net marketplace stiffens.

Corvus Systems, Inc. introduced a network operating system aimed at slashing the price of per-node connections by as much as five times the going rate, according to the company. The company's PC/NOS software, which runs on Corvus' Omninet local-area network, features support of IBM's PC/DOS 3.1 file and record-locking calls.

PC/NOS also supports multiple servers and provides security control for nodes, peripherals, disk directories and files. The operating system is an advanced implementation of one developed by Applied Intelligence, Inc., which Corvus acquired in March. A 64-user version costs $695.

Fox Research, a local net vendor that enjoys fame in Europe but is struggling to penetrate the U.S. market, attracted some attention here with fiber-optic and gateway products for its 10-Net local network. Fiber-optic products included: the 10-NET Fiber Optic Board ($995), which allows users to use either fiber-optic cable or standard twisted-pair wiring; an eight-node fiber-optic hub dubbed 10-Net Fiber-Optic Hub ($1,995); and the Fiber-Optic Repeater ($795), which allows an existing 10-Net cluster to be connected to fiber-optic cabling.

The fiber-optic board is designed for 1M or 2M bit/sec transmission and uses Ethernet protocols. The fiber hub supports an architecture similar to AT&T's Starlan hub and sports a ninth connection that allows users to link hubs. The repeater lets users connect 10-Net clusters via fiber cable.

Fox's gateway product line, to be available in late November, includes Systems Network Architecture and Binary Synchronous Communications gateways for 10-Net to mainframe communications.

The gateways are priced between $795 and $1,995.

Joining the recent parade of diskless personal computer offerers was Santa Clara Systems, Inc., acquired by Novell, Inc. this month, with the introduction of its PC Terminal. At $699, PC Terminal is Santa Clara Systems' answer to price-cutting in the local net business. An IBM Personal Computer-compatible with a built-in network connection, PC Terminal runs about 50% less expensive than competing workstation products, according to Santa Clara. The unit's integral network connection is based on an Ethernet carrier-sense multiple access with collision detection high-speed interface, and is fully compatible with Novell's network operating system.

While others try to up the ante by cutting prices, 3Com Corp. moved to reach a wider user base through a new marketing agreement unveiled at the show. At a press briefing here, the company announced an agreement with Tandy Corp. to sell certain networking products through Tandy's Radio Shack Computer Centers.

Currently, the deal includes 3Com's Ethernet adaptor products, Etherlink and Etherlink Plus, and the 3+ network operating software. Tandy markets primarily to the low-end and mid-sized business user. As a consequence of the agreement with Tandy, 3Com's relationship with Open Systems, Inc., with whom 3Com jointly develops and markets accounting packages for local nets, will evolve into the development of complete workgroup accounting solutions for sale through Tandy.

Siemens Information Systems, Inc. made its debut as a local net vendor at Comdex. Its Fiber Optic, Active Star Local-Area Network is 802.3 compatible and will be available in spring 1987. Siemens plans to market the system principally through value-added resellers, systems integrators and OEM channels.

Siemens' offering consists of three primary components. A rack-mounted Star Coupler houses up to 16 dual-channel, plug-in modules to support as many as 32 network nodes. Nodes are tied to the coupler through optical transceivers and fiber cable. A spokesman said pricing for the local net components has not yet been determined.

▶ CAMPUS COMPUTING

IBM, Carnegie Mellon U. christen Andrew system

Distributed network to link 7,000 PCs.

BY NADINE WANDZILAK
Staff Writer

PITTSBURGH — Carnegie Mellon University last week inaugurated a campuswide network that integrates existing local nets with a new distributed computing system, dubbed Andrew.

As part of the overall network project, the university has wired the campus to accommodate some 7,000 workstations.

Four hundred miles of the IBM Cabling System now snake within 50 university buildings. Fiber-optic cable connects 25 campus buildings.

Approximately 1,000 workstations and personal computers are already connected to the network, according to James Morris, director of the university's Information Technology Center.

With its new campuswide network, "Carnegie Mellon University has done something no one else has done," Morris said.

"The university has put in a complete wiring plant, bottom to top, with multiple plugs in every room in the university, every dormitory, every classroom. Other universities are patching networks together.

"We made a major capital investment in wiring," he continued. The university's wiring bill, including a project to overbuild, or provide excess capacity, on all fiber-optic connections between campus buildings, was just under $7 million, according to Robert Cape, the university's director of telecommunications.

The largest computing system on the new network is Andrew, explained John Leong, the university's associate director of network development.

Andrew includes workstations and multiple file servers that are interconnected with the university net via an IBM Token-Ring Network.

The university named the system after Andrew Carnegie and Andrew Mellon, the two main benefactors of the school.

Using a workstation such as an IBM RT Personal Computer linked to the IBM Token Ring, students can exchange electronic mail and messages and call up campus bulletin board notices.

They can also use the system to receive and complete course assignments, create research papers and retrieve data base information from files, libraries and campus directories.

Andrew was conceived in 1982. A team of employees from Carnegie Mellon and IBM developed the system, which IBM owns.

IBM announced last week that it plans to provide, in the last half of 1987, Andrew software that runs under the Academic Information System, a version of Unix 4.2 developed by IBM's Academic Information Systems division in Milford, Conn.

The Andrew software runs on IBM, Sun Microsystems, Inc. and Digital Equipment Corp. workstations, or on any workstation that runs a Berkeley Unix operating system and has a bit map display, Morris said.

"It's better to be committed to an operating system than to a particular piece of hardware in an environment where workstation prices are cut in half every 18 months," he said.

As early as 1981, computer use on the Carnegie Mellon campus was so widespread that the university found it difficult to keep up with the demand on its time-shared mainframe, according to a report on Project Andrew. A task force suggested a shift to personal computing and called for the creation of a campuswide network. As users found that more could be done on micros, host computers were downplayed.

"If you have a mainframe, sooner or later the mainframe will become a bottleneck," Morris elaborated.

"If you have a system based on small file servers you can increase your investment slowly.

"We can handle bottlenecks by adding more small computers with big disks on them and adjust the load."

All freshmen at Carnegie Mellon met Andrew this semester when they were taught to use the new network.

Dama from **page 2**

on microwave technology. The DG network was to have been based on these digital services. As part of its reorganization, Dama plans to sell off its voice network. A Dama spokesman said a buyer has been found, and its name will be announced in the next few months.

It is unclear what DG's next steps will be. A company spokesman refused to comment on the impact that Dama's current problems may have had on DG's future plans or on DG's role in Dama's recent actions. He emphasized that the company is still interested in Dama's digital transmission facilities.

Just how successful DG would be if it entered the transmission business is open to question. A number of computer manufacturers are struggling to branch out into the telecommunications industry. IBM, Wang Laboratories, Inc., Digital Equipment Corp. and Hewlett-Packard Co. are all working to add transmission facilities to their product lines. Thus far, these companies have experienced little financial success in this area.

One problem is that current carriers are placing roadblocks in front of companies attempting to enter the transmission business. Joaquin Gonzalez, service director for enterprise network strategies at Stamford, Conn.-based Gartner Group, Inc., said carriers such as AT&T are able to institute predatory pricing strategies designed to nip the companies in the start-up bud. "The large carriers can undersell their services in an area where a new company may be starting out," he said. "This makes it extremely difficult for the emerging company to compete effectively."

Tandem from **page 1**

Tandem is implementing its strategy through Multilan, a series of hardware and software products that allow Tandem's on-line transaction processing systems to connect to local-area networks that support NETBIOS protocols. NETBIOS defines communications between a network interface card and the PC-DOS operating system.

In a related announcement today, Tandem introduced Wordlink, a collection of software products that support IBM's Document Content Architecture and enable document exchange among dedicated word processing systems and personal computer-based word processing packages. Tandem has licensed document translation technology from Soft-Switch, Inc. and will be incorporating this technology in its own Transfer and PS Mail programs.

By supporting NETBIOS, Tandem is allowing users to implement the local network they want, said Chris Erickson, director of software product management. Multilan reportedly supports IBM's Token-Ring Network and PC Network, Ungermann-Bass, Inc.'s Net/One, Sytek, Inc.'s System 6000 and other local nets that have adopted the NETBIOS interface.

"Frankly, I'm surprised other vendors haven't selected this approach. The customer no longer wants vendors to dictate what solution they should select," Erickson said.

Multilan also allows Tandem systems to act as fault-tolerant file servers for local network users, extending Tandem system capabilities to personal computers, Erickson said.

"Our large customers today are using the NETBIOS interface to develop on-line applications. Our customers want to be able to take advantage of the personal computer as a workstation in these applications," Erickson said.

Multilan's primary appeal will be to Tandem users, said Lee Doyle, senior communications analyst for International Data Corp. of Framingham, Mass. However, in light of the fact that Tandem is slated to introduce a line of low-end systems next year, the company could find itself competing with Novell, Inc., which already offers fault-tolerant file servers, Doyle said.

"That presents a very interesting development," he added. Novell and Tandem are targeting many of the same users, such as financial institutions, with their fault-tolerant systems. Tandem's Erickson acknowledged, "The new low-end systems, we believe, will be the predominant delivery system as a file server."

Doyle noted that Tandem had no choice but to support NETBIOS, saying, "If they want to connect to a number of different LANs, NETBIOS is the only common denominator. This announcement is significant in that it points that out."

Multilan hardware consists of a $4,000 dual-port controller that resides in the Tandem system, a $4,000 attachment device that resembles a personal computer and provides the connection to the local net and a 10M bit/sec link between the two devices. Each controller is capable of supporting one type of local-area net; each Tandem system can support multiple controllers.

Multilan software includes file and printer server software, emulation software for Tandem's 6530 terminal family and a NETBIOS application interface that can be used to develop cooperative processing applications. Multilan pricing depends on the Tandem system used and ranges from a $6,400 initial license fee with a $300 monthly license fee for the NonStop VLX, TXP and II systems to a straight $75 monthly license fee for the NonStop EXT10 systems.

Wordlink includes a batch gateway for interfacing with word processors using IBM 2780/3780 communications, a Tandem PS Text Format translator and an ASCII translator. Optional Wordlink-Wang, Wordlink-DCA and Wordlink-Multimate translators are also available. Wordlink pricing includes a $2,000 initial license fee and a $75 monthly fee for the NonStop EXT, EXT10 and EXT25.

AT&T from **page 1**

tions," said Peter Hagen, assistant staff manager of AT&T's consultant liaison program. Although the company will not release the number or names of SDN subscribers, Frank Dzubeck estimates there are roughly 50 users. Dzubeck is president and chief executive officer of Communications Network Architects, Inc., a Washington, D.C. consulting company.

"They have fewer SDN customers than anticipated," Dzubeck said, "but the accounts they have are much larger than expected."

Control Data Corp., Transamerica Corp. and Philip Morris, Inc. are three known SDN customers.

According to Bob Ellis, president of the Aries Group, a consulting firm in Rockville, Md., the rising cost of private lines forced one large user to reduce its five-node electronic tandem network (ETN) used to support 200 corporate locations to a three node ETN net supporting 150 locations. The company installed SDN to support the remaining 50 sites, Ellis said.

SDN provides private network-like capabilities over switched facilities by establishing routing instructions in the memory of AT&T switches. Net links are only established when needed. This enables customers to maintain 7- or 10-digit corporate numbering plans.

The main attraction of SDN is cost, according to Doanne Perry, a senior telecommunications analyst with International Data Corp., a research firm in Framingham, Mass. Perry said, however, that sophisticated users want to retain some private line options and will create hybrid SDN/lease line networks such as Philip Morris'.

Last month, AT&T reduced the one-time SDN installation fee from $105,000 to $60,000. Although some observers interpreted the move as a desperate ploy to entice new users, AT&T maintains it found the service was less expensive to engineer than anticipated, and said it wanted to remain competitive with similar services from other carriers.

Dzubeck said the lower entrance cost will attract new customers who were wary of the former heavy, up-front capital investment. He added that customers are satisfied with the service, a claim he attributes to AT&T's careful planning. "Before AT&T cuts an SDN customer over, quality control checks the service to death," Dzubeck said.

While minimizing problems, this stringent control results in service lead times of six months to a year, according to AT&T's Hagen.

Megacom and Megacom 800, services targeted at WATS and 800 users that make 1,000 hours of calls or more per month, are also regarded as high-quality services, according to analysts. AT&T service manager Lew Fishman said many customers have already decided to install the services at additional corporate locations.

AT&T's projected savings over WATS and 800 service have held true, Fishman said. Although it varies case by case, Megacom is saving the average user 5% to 7% over WATS, and Megacom 800 is saving customers 4% to 6% over standard 800, he claimed. Megacom rates have decreased 14% since they were introduced, Fishman said, and further reductions are likely. Although Megacom has a shorter lead time than SDN, installation intervals still range from 30 to 180 days.

Fishman would not reveal the number or names of any Megacom users, although Merrill Lynch and Co. in New York is believed to be one early service customer.

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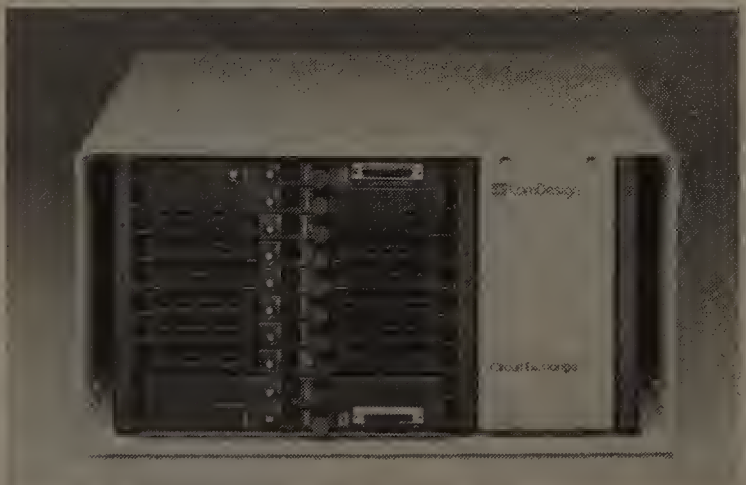

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Huber from **page 2**

He examined the economic, technological and legal issues surrounding the Modified Final Judgment.

Prior to presenting its recommendations to Judge Greene in January, the Justice Department will consult with other executive branch agencies. Agencies to be consulted will include the Department of Commerce, the National Telecommunications and Information Administration and the Department of State on other issues affecting the industry, such as international trade and competition.

Judge Greene is the ultimate arbiter deciding whether changes will be made to the Modified Final Judgment.

▶ BIG BLUEPRINT

IBM's Hancock harps on connectivity committal

Users' needs stressed at DMW conference.

BY MICHAEL FAHEY
Staff Writer

NEW YORK — Outlining IBM's communications strategy last week, Ellen Hancock, president of IBM's Communication Products Division in Raleigh, N.C., never strayed from the company's watchword of connectivity and refused to discuss goings-on at IBM's Rolm Corp. subsidiary or partner MCI Communications Corp.

"When you look for a theme in the myriad of products, the new technologies and the varying approaches to networking, there is one simplifying factor. It is called connectivity and it emerges time after time," Hancock said at DMW Group, Inc.'s World Update conference here.

In her remarks to attendees, Hancock said IBM recognizes the need for connectivity between multivendor systems and emphasized IBM's support for international standards and an open communications architecture. Stressing what she called IBM's practice of listening to users' needs in order to craft its strategy, Hancock said, "Listening helps us develop our strategy, and then we articulate it. We're doing it now for telecommunications just as we've done it for SNA."

Hancock said IBM "plans to improve communications capabilities of its systems, whether or not they depend on a host computer." This, she said, is in keeping with IBM's goal of "any-to-any connectivity, regardless of the equipment technology that is being used."

Throughout the prepared portion of her talk, Hancock avoided any mention of IBM's relationship with MCI. However, during a discussion period , Hancock was asked if she had deliberately sidestepped comment on transmission. Hancock said she had avoided the subject because, despite its relationship with MCI, "IBM is not in the transmission business."

Hancock said there are so-called enterprise customers that IBM, Rolm and MCI would work with to jointly deliver products and services. She seemed to be referring to IBM's Enterprise Program, which was set up to provide end-to-end computer and network systems for the company's largest accounts.

Although Hancock discussed IBM's joint research efforts with Rolm in developing the Netview personal computer net management system, she refused to discuss whether Rolm will release the rumored CBX III private branch exchange.

Localnet from **page 2**

ing introduced to the U.S. "Although they're looking at fairly distinct areas, there is a considerable amount of overlap in the shows," Shaw said in explaining why the conferences are being held concurrently.

Charlie Bass, co-founder of Ungermann-Bass, Inc. along with Mike Pliner, chairman of Sytek, Inc., Judy Estrin, executive vice-president of Bridge Communications, Inc., and Ray Noorda, president of Novell, Inc. will sit in on Localnet '86's keynote panel, moderated by Mark Stahlman, research analyst for Sanford C. Bernstein. The panel will focus on whether local nets are computing or data communications vehicles.

However, users may be more interested in learning how to connect local nets to other resources. "Connectivity is an issue when you're dealing with a multivendor environment," said Harvey Shrednick, vice-president of information services at the Corning, N.Y.-based Corning Glass Works. "Trying to get networks to talk to each other is not easy."

Shrednick said vendors have demonstrated how to tie Ethernet, Digital Equipment Corp.'s Decnet and IBM's System Network Architecture together. "But I don't know anybody who has got their act together totally," he added.

Glenn Lukowicz, MIS Director for the Providence, R.I.-based Speidel division of Textron, Inc., agrees. "You're not trying to launch the next space shuttle. All you're doing is trying to connect a varying amount of computing capacity and integrate the information available to each one."

Compounding interconnectivity woes, Lukowicz said, is the problem of installing a product sold to solve a particular problem only to find out that more was promised than could actually be delivered. When that happens, he added, "Management looks at you like you don't know what to look for or you don't know what criteria to use to measure what you're looking for."

With connectivity comes increased security woes. "The more connectivity you have, security becomes more and more of an issue," said Robert Tobiasson, manager of computing and networking services for the Tacoma, Wash.-based Hillhaven Corp., which owns about 400 nursing homes nationwide.

Connecting a local-area net to a mainframe without implementing proper security measures opens the corporate network environment to outsiders. "It's analogous to locking the doors on a convertible with the top down," said Harry Tompkins, manager of telecommunications planning and engineering at Ardsley, N.Y.-based U.S. headquarters of Ciba-Geigy, an international chemical company.

Railinc from **page 5**

inc's official registry of rail cars, trailers and containers.

Three major auto manufacturers also use Train II to minimize the movement of empty freight cars. Chrysler Corp., Ford Motor Co. and General Motors Corp. each maintain a fleet of rail cars to transport inventory. Railinc's Reload system lists the location of inventory in a data base, then plots the optimal use of the rail cars. Meetze said Railinc's system saved some 160 million empty car miles a year, at between 35 and 50 cents a mile. "We're talking about a lot of money there," he said.

While dedicated access to Train II has remained almost unchanged since Train II was created, the number of dial-in users has grown to well over 100, according to Meetze. "These folks are principally shippers and suppliers who want to exchange data electronically with rail carriers without the expense of a dedicated line. They're only going to come in once a day and pick up or deposit a small amount of data."

Railinc began to add dial-in customers on a Binary Synchronous Communications basis in 1982 and added asynchronous access in 1984. Based on the increase in dial-in usage, Railinc established a customer support center in February. Railinc plans to offer asynchronous error-checking by mid-1987.

In addition to traffic tracking, Train II also handles message switching, including transfer of purchase orders and invoices. Since October 1985, Meetze has seen a fourfold increase in purchase order volume to 22 million characters.

"We think EDI [Electronic Data Interchange] gives us an edge over competing modes of transportation," Meetze said. "We can take business data and transmit it through a single network to give shippers an electronic window on the entire rail industry."

To make it easier to prepare and exchange purchase orders, invoices and freight bills electronically between railroads and suppliers, Railinc has developed a personal computer-based software package. Railinc's EDI/Synapse software allows any organization to input and format data with a minimal amount of setup time, Meetze said. "We're trying to make it easy for people to connect with our network." The software is being tested now for release this year.

Railinc is also expanding the network in other directions. Recently, Railinc instituted a freight tracing system for shipper agents. "These customers provide us electronically with a list of trailers or containers they want traced," Meetze explained. "We query the railroads' computer on their behalf, pick up the location information and deposit in an electronic mailbox. That's working fairly well."

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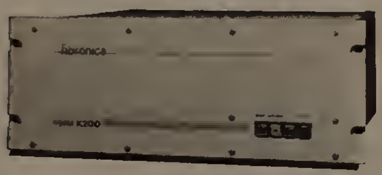

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Nov. 17, New York — Data Broadcasting Technology. Contact: Waters Information Services, Inc., 34 Chenango St., Binghamton, N.Y. 13901.

Nov. 17-18, Seattle — Data Communications and Networking for the IBM Personal Computer XT/AT and Other Compatibles. Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

Nov. 17-19, Boston — PC Data Communications and Networking for the Non-Data Communications Professional. Contact: Data-Tech Institute, Lakeview Plaza, P.O. Box 2429, Clifton, N.J. 07015.

Nov. 17-19, San Francisco — Managing the Strategic Data Planning Project. Also, Dec. 17-19, Boston. Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

Nov. 17-19, Stamford, Conn. — Telecommunications Markets: The Impact of IBM. Contact: Chris Sherman, International Resource Development, Inc., 6 Prowitt St., Norwalk, Conn. 06855.

Nov. 17-19, Atlanta — The Thirteenth Annual Computer Security Conference. Contact: Computer Security Institute, 360 Church St., Northborough, Mass. 01532.

Nov. 17-20, Salt Lake City — Eighth Interservice/Industry Training Systems Conference. Contact: Col. P.J. Cole, National Security Industrial Association, 1015 15th St. N.W., Suite 901, Washington, D.C. 20005.

Nov. 17-20, Boston — Experts on Networks. Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

Nov. 18-19, Boston — PC Coordinator Workshop. Also, Nov. 20-21, Detroit; Nov. 20-21, Washington, D.C.; Dec. 11-12, Detroit; Dec. 10-11, Los Angeles. Contact: System Resources, 123 N. 4th St., Minneapolis, Minn. 55401.

Nov. 18-20, San Francisco — Localnet '86. Contact: Online International, 989 Avenue of the Americas, New York, N.Y. 10018.

Nov. 18-20, Chicago — Switched Networks for Voice and Data. Contact: ABC TeleTraining, Inc., P.O. Box 537, Geneva, Ill. 60134.

Nov. 19, Washington, D.C. — Capitol Wo/Men in Telecommunications. Contact: Capitol Wo/Men in Telecommunications, P.O. Box 18035, Washington, D.C. 20036.

Nov. 19-20, Boston — Educational Seminar on T-1 Facilities and Networking. Contact: Timeplex, Inc., 400 Chestnut Ridge Road, Woodcliff Lake, N.J. 07675.

Nov. 19-21, San Francisco — Bypass Networking with Small Satellite Terminals. Contact: Technology Transfer Institute, 741 10th St., Santa Monica, Calif. 90402.

Nov. 19-23, San Diego — The Society of Telecommunications Consultants' Fall Conference. Contact: Effie Cooper, Society of Telecommunications Consultants, Suite 1410, One Rockefeller Plaza, New York, N.Y. 10020.

Nov. 20-21, Palo Alto, Calif. — Token-Ring Network & Application Program Interfaces Seminar. Contact: Communications Solutions, Inc., 992 S. Saratoga-Sunnyvale Road, San Jose, Calif. 95129.

Nov. 20-22, Chicago — The Sixth Chicago Computer & Business Equipment Showcase. Contact: The Interface Group, 300 First Ave., Needham, Mass. 02194.

Dec. 8-9, Boston — Understanding the X.25 Protocol and Packet Switching Networks. Contact: Data-Tech Institute, Lakeview Plaza, P.O. Box 2429, Clifton, N.J. 07015.

Dec. 4-5, Washington, D.C. — Competitive Technology Strategies of AT&T, The BOCs and IBM. Also, Jan. 12-14, Park City, Utah; March 19-20, Chicago. Contact: TeleStrategies, 1355 Beverly Road, McLean, Va. 22101.

Dec. 8-10, Stamford, Conn. — Private Networks: Future Directions. Contact: Chris Sherman, International Resource Development, Inc., 6 Prowitt St., Norwalk, Conn. 06855.

Dec. 8-11, Washington, D.C. — National Data Communications Symposium on Local Area Networks and Micro-Mainframe Links. Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

Dec. 11-12, Boston — Advanced Communications Architectures Seminar. Contact: Communications Solutions, 992 S. Saratoga-Sunnyvale Road, San Jose, Calif. 95129.

Dec. 16, Washington, D.C. — How to Bid on $2 Billion in Telecommunications Projects. Contact: U.S. Telecommunications Suppliers Association, Suite 1618, 333 N. Michigan Ave., Chicago, Ill. 60601.

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Karen Wallace
Account Coordinator
375 Cochituate Road.
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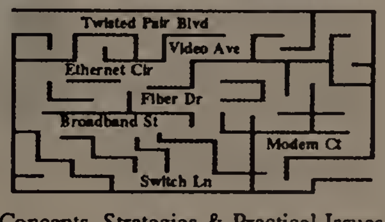

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▶ PRODUCT REVIEW

V.32 modems: Do they deliver?

Three devices attempt to fulfull the promise of the CCITT V.32 specification.

BY JOHN J. HUNTER
Contributing Writer

About two years ago, the telecommunications industry was buzzing about the newly announced CCITT V.32 specification, which seemed to be the answer to the prayers of those using the direct distance dialing (DDD) network to transfer data.

V.32, for example, allows full-duplex 9.6K/4.8K bit/sec operation over a standard AT&T 3002 telephone line and specifies a trellis-coded modulation scheme that performs forward error correction. But the jury is still out on the question of whether any V.32 modem can deliver a consistent 9.6K bit/sec rate over dial-up lines.

Today, V.32 has been incorporated into three commercially available modems: Anderson Jacobson, Inc.'s AJ 9631-S, Codex Corp.'s 2260 and Concord Data Systems, Inc.'s V.32 Trellis.

Concord Data claims to have 2,000 units installed. No sales figures are available from Codex or Anderson Jacobson.

British Telecommunications Plc. has also announced a V.32 modem, but that product allegedly will not perform forward error correction.

How they stack up

All three modems operate full- or half-duplex at 9.6K and 4.8K bit/sec on the DDD network and over two-wire leased lines, and all employ trellis-coding to perform forward error correction. The Concord Data and Anderson Jacobson units also operate with easily obtainable four-wire leased lines.

When operating at 9.6K bit/sec and employing trellis-coding, the products use the V.32-recommended Quadrature Amplitude Modulation signal coding pattern, which consists of 32 distinct states, or points. The modems signal at 2,400 baud and encode five bits per baud. Four bits are for user data and one is for trellis-coding. Therefore, even though the total transmission rate is 12K bit/sec, only 9.6K bit/sec contain data.

Currently, only the Codex 2260 supports both asynchronous and synchronous transmission. Anderson Jacobson and Concord Data state that asynchronous facilities will be available for their units either late this year or early next, and both claim that their modems will support error correction using Microcom, Inc.'s Microcom Networking Protocol (MNP) Level 4 scheme. Codex is also examining several error correction methods, including MNP. All three vendors state that they will conform to the as-yet undecided CCITT asynchronous communications standard for V.32 modems.

All the modems have built-in autodialers and permit users to store commonly called numbers that can be initiated manually or under program control. The Concord Data unit stores 10 telephone numbers, while the Codex and Anderson Jacobson products accommodate nine and eight numbers, respectively. All the units allow telephone numbers to be linked, and all will automatically initiate a call to designated alternate numbers when the primary number is busy.

Of the three modems, only Codex now implements the Hayes Microcomputer Products, Inc. AT Command Set. Anderson Jacobson uses the CCITT V.25bis autodialer facilities, and Concord Data supports Bell Auto Call Unit (ACU) signaling through a separate RS-366 port.

Concord Data also offers its own proprietary autodial command set. Anderson Jacobson claims that support for the Hayes AT Command Set will be available on its V.32 modem by the end of this year or early next. Concord Data states that the Hayes AT Command Set will be supported on a new dial-line-only version of its V.32 modem as well as a new leased line/dial line V.32 modem, both of which are due out early next year. The latter unit will also support the current RS-366 signaling.

Features of three V.32 modems

	Vendor/Product		
	Anderson Jacobson, Inc./ 9631-S	Codex Corp./ 2260	Concord Data Systems, Inc./ V.32 Trellis
Synchronous	✓	✓	✓
Asynchronous	*	✓	*
Stored telephone numbers	8	9	10
Hayes AT Command Set	*	✓	*
Delay compensation (sec)	2.2	1.0	2.2

* Planned for late 1986 or early 1987

SOURCE: TMS CORP., DEVON, PA

All three modems permit users to dial numbers directly but differ in how they implement this. The AJ 9631-S and the Codex 2260 allow users to enter telephone numbers through membrane pushbuttons on the front panel, obviating the need for a separate telephone to initiate the call. The Concord Data unit requires a telephone.

When operating over the DDD network, the modems constantly monitor the quality of the transmission facility and switch to the 4.8K bit/sec fallback speed when 9.6K bit/sec operation cannot be sustained. When the line improves, 9.6K bit/sec resumes.

When operating with a leased line, all three modems constantly monitor the near-end and far-end transmission medium for a high incidence of errors, and all support a switchover to a dialed line backup when the error rate reaches between 10^{-3} or 10^{-4} bit/sec.

With the Concord Data unit, the switchover from leased to dial backup is automatic. It must be manually initiated on the Codex 2260, and it can be done manually or automatically with the Anderson Jacobson 9631-S. Moving back to leased line operation must be done manually with the Concord Data and Codex products, but is done automatically with the Anderson Jacobson modem's "lookback" scheme.

With lookback, the operator can set the modem to monitor the condition of the leased line every 15, 30, 60 or 120 minutes to determine whether it is within specifications and will, therefore, support continued transmission.

If the line is not within specifications, the modem suspends data transmission until the leased line link is re-established. After transmission is reinitiated, the modem holds the dial backup line open for 10 seconds to ensure consistent line quality. This procedure eliminates the redial operation, should transmission quality degrade, and speeds the entire switchover process.

Stand-alone versions of the Concord Data and Codex modems are priced at $3,495 (single quantity), while the stand-alone Anderson Jacobson 9631-S lists for $2,995. Rack-mounted versions are about $3,195 for the Codex, $3,145 for the Concord Data and $2,975 for the Anderson Jacobson unit, depending upon packaging.

With V.32 modems, echo cancellation is used to make full-duplex operation possible over two-wire circuits without employing the frequency-division techniques used in low-speed modems like the Bell 212A and CCITT V.22 and V.22bis units.

There are two types of echoes: those between the user site and the near-end central office and those from the remote end. Near-end echoes vary from 1 to 2 msec, while far-end echoes can be as long as 40 msec. With satellites, the echoes can be up to 500 msec for each satellite employed. Echo canceling isolates the signal received from the remote modem by eliminating interference caused by the transmitting signal as well as reflections of the signal echoed back from the near-end and remote-end central office.

Real world performance

It's hard to argue with the logic behind the V.32 specification. After all, 9.6K bit/sec full-duplex operation over dial-up lines is an ideal way to transmit low-speed data. But this scenario does not reflect real-world conditions. In fact, the dial-up transmission facilities the V.32 modem works with are almost hostile.

Using a 1,200 bit/sec modem to send relatively small files over the DDD network has given many users a healthy respect for the modem's error-correcting software. If the DDD network has problems at 1,200 bit/sec, what awaits a unit operating at 9.6K bit/sec? The trellis error-correcting facility must get quite a workout.

These V.32 modems also allow the user to turn off the error corrector and run the units at 9.6K bit/sec. In these cases, it will take some sophisticated equalizer circuits to keep the modem from retreating to its 4.8K bit/sec fallback speed. Aside from cutting the transmission speed in half, fallback operation requires near- and far-end modems to resynchronize, during which time no data can be passed.

Things aren't much better when long-distance telephone calls are handled by a satellite. While satellite delays are annoying enough for voice conversations, the 500-msec transmission delay extracted by each satellite makes error cancellation difficult, unless the modem has sufficient storage to compensate for delay times. Both Concord Data and Anderson Jacobson claim that their products can withstand 2.2-sec delays and still maintain acceptable performance. Codex's modem can handle a 1-sec delay.

While it is trite to caution users to try before they buy, that caveat cannot be overemphasized with V.32 modems. Terrestrial transmission media varies greatly, and you never know when a satellite will be used. Users should check with the telephone company to determine at what times it is most probable that a satellite will be used and try to schedule tests during those times. Users who can't be bothered had better figure on using leased lines if they want a fairly consistent 9.6K bit/sec throughput.

Users who are forced to employ four-wire dedicated lines to achieve a consistent 9.6K bit/sec throughput should investigate the applicability of CCITT V.29 modems. Those units, which are priced at about half the cost of V.32 units, also provide 9.6K bit/sec synchronous transmission and have fallback rates of 7.2K bit/sec and 4.8K bit/sec operating in full- or half-duplex mode.

Hunter is president of TMS Corp. in Devon, Pa.

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